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Utility-Transportation Corridor Study for Montana

The Existing Situation and Options for Future Corridor Selection

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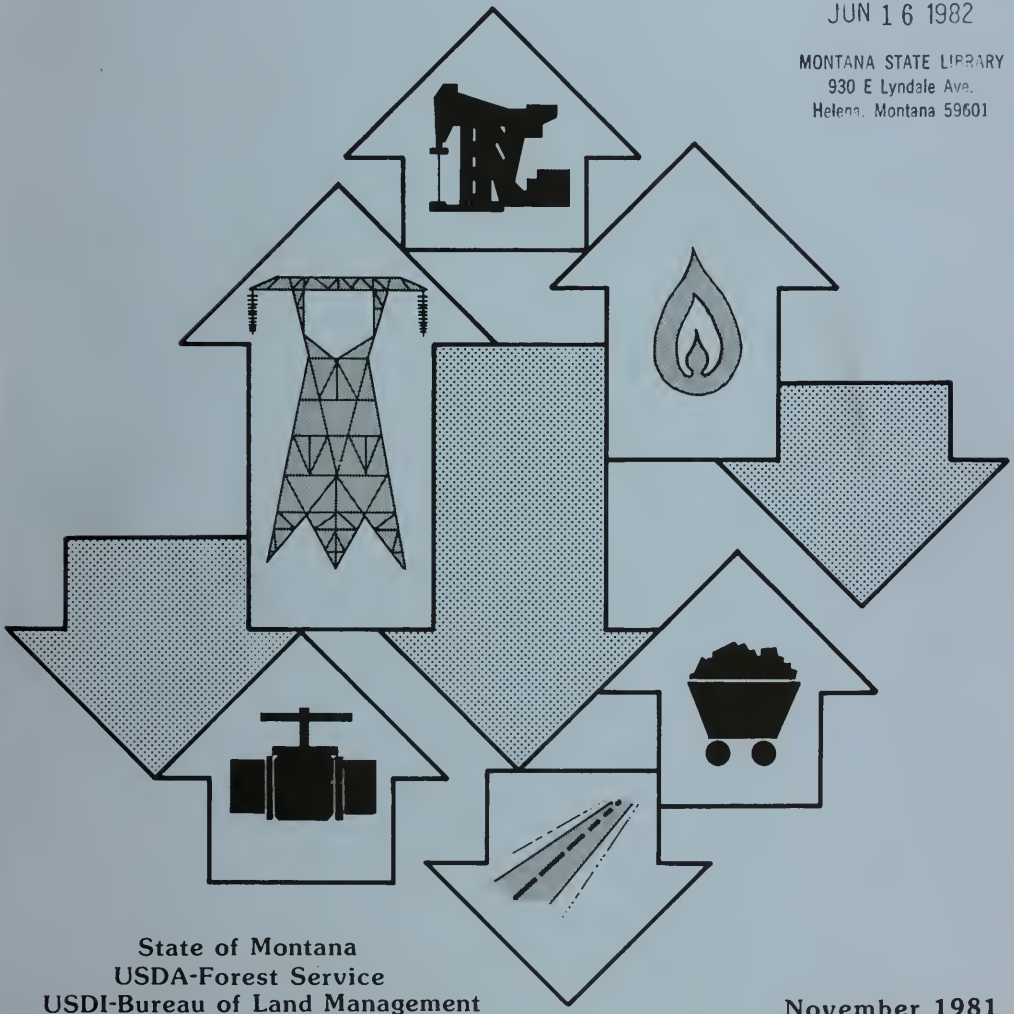

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ABSTRACT

This report discusses the linear utility and transportation facility situation in Montana with the intent of establishing a basis for continuing corridor planning on federal land within the state.

Section I outlines the background for corridor planning in Montana and the western United States.

Section II provides an assessment of the linear facility situation. It includes chapters on: (1) existing and projected linear facilities, (2) regulatory, land management and facility siting situations, (3) policies and other considerations of right-of-way users, (4) technical/engineering compatibility considerations, and (5) land use, land ownership and social concerns.

Section III contains a discussion of corridor selection processes for Montana.

Section IV identifies the conclusions and recommendations. The recommendations are:

1. Continue the principle of intergovernmental cooperation for future corridor planning and right-of-way siting in Montana.

2. Adopt the combined window, exclusion area and avoidance area concept for identifying and selecting corridors in Montana by implementing the "Option 2—Phased Identification of Windows and Exclusion and Avoidance Areas." Develop criteria for identifying exclusion areas, avoidance areas, and windows. This task would include public involvement, with recommendations advanced to the Governor of Montana, Regional Forester, and the State Director of BLM.

3. Incorporate the direction of Recommendation 2 into federal land management planning.

4. Establish a joint state/federal Corridor Oversight Committee to review land management plans and to assure that Montana corridor goals are achieved. The authority and functions of this committee still need to be defined.

5. Develop a common federal/state analysis, evaluation and decisionmaking process for individual right-of-way proposals under joint jurisdiction of federal and state agencies.

6. Advance Montana's joint corridor planning approach to other federal and state agencies in the West to achieve interstate consistency in right-of-way and corridor decisions.

7. Encourage public participation by distributing a summary of this report to the public for review and comment.

8. Develop the Phase V Right-of-Way Management Program as a separate effort.

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SECTION I—INTRODUCTION

The nation's demand for energy self-sufficiency is growing at a time when competition among many types of land uses and resource values is becoming more intense. Many of the energy resources needed to reach the goal of national energy self-sufficiency are located in the western United States. However, much of the demand for these resources originates from major population centers in the Midwest and on the West Coast. Transporting energy from the resource areas to the demand or "load" centers requires pipelines, railroads, and electric transmission lines. Selecting routes for such facilities is complicated due to environmental and engineering constraints, land use, and land ownership conflicts. Government agencies, both at the federal and state levels, have the task of resolving these often conflicting values and use requirements when choosing acceptable routes for linear facilities. This situation presents challenges to land management and energy facility siting agencies to determine acceptable locations for rights-of-way and to devise more effective planning policies and procedures.

Concern at the national level for meeting future right-of-way needs while protecting the environment led to legislation authorizing the USDA Forest Service (FS) and USDI Bureau of Land Managment (BLM) to designate corridors on federal lands. Title I of the Mineral Leasing Act of 1920, as amended, provided the BLM authority to designate corridors for oil and gas pipelines. Title V of the Federal Land Policy and Management Act of 1976 provided both the FS and BLM authority to designate corridors for other linear facility rights-of-way. In addition, the National Forest Management Act of 1976 addresses this issue through land management and planning guidelines for existing and future linear facilities on National Forest System lands. The State of Montana does not have the authority to designate corridors. However, the state's Major Facility Siting Act regulates the siting of certain energy facilities in Montana.

The State of Montana and the federal land management agencies are concerned with preventing future land use, land ownership and jurisdictional conflicts in siting facilities. The Colstrip 500 kV electric transmission lines and the Northern Tier Pipeline are two projects that have highlighted land use and jurisdictional conflicts associated with major linear facilities in Montana. For each of these projects, a joint federal-state environmental impact statement would have been highly desirable, but for various reasons efforts promoting such a partnership failed. These projects have, however, given state and federal agencies insight into the importance of coordinating reviews of proposed projects and planning jointly for future rights-of-way.

Corridor planning by federal agencies will occur along with federal land management planning. Such planning and right-of-way decisions pertaining to federal land also will affect surrounding private landowners and lands managed by the state. In addition, the potential environmental impacts associated with right-of-way use on federal and adjoining lands are important state and local concerns.

In an attempt to address these issues and problems, the State of Montana, the Montana office of the BLM, and Region 1 of the FS agreed in August 1980 to undertake a cooperative interagency corridor planning study. The study agreement is explained fully in *The Utility Transportation Corridor Work Management Plan for Montana* which outlines a five-phase study designed to develop a cooperative corridor planning process for Montana (USDA, USDI, State of Montana 1980). Table 1 lists the goals and objectives for the study.

As outlined in the Work Management Plan, the five phases were to accomplish the following tasks:

1. Document the existing linear facility situation in Montana and identify potential problems which may be encountered in corridor planning (Phase I);

2. Outline cooperative policies, siting criteria, and overall stipulations by right-of-way type for joint interagency siting of linear facilities (Phase II);

3. Evaluate various options for applying a corridor siting process and recommend a selected interagency approach (Phase III);

4. Consider the need for corridor designation through the land use planning process and explore methods of site specific evaluation on individual proposals, as well as long-term planning for corridor management by federal agencies (Phase IV);

5. Develop joint cooperative management agreements as the basis for determining compliance and monitoring of rights-of-way (Phase V).

Since Montana's study began, corridor related studies and planning activities have begun in other western states and at the national level. Currently, national goals and objectives for FS and BLM corridor planning are being formed. The schedules and the general direction set by these national efforts will determine corridor planning and management priorities for federal agencies on the state level.

Forest Service corridor guidance will probably be included as part of the regional and forest management plans starting in 1981. Individual forest plans are currently in preparation and require guidance concerning corridor planning. The BLM resource management plans are due in 1984, but the BLM national office is attempting to facilitate BLM corridor planning decisions within a time frame that more closely parallels FS activities.

Although the State of Montana does not presently have a policy on corridors, this joint intergovernmental corridor planning effort has raised many important questions concerning the development of such a policy. The schedules for federal land management planning

TABLE I

Goals and Objectives for Montana's Joint Federal/State Corridor Planning Study

GOALS	OBJECTIVES
Minimize the social, economic, and natural resource impacts of linear rights-of-way.	Establish an interagency corridor coordinating process.
Preserve land uses on federal and state lands which represent the highest public benefit.	Inventory and map the linear facilities in Montana.
Achieve an efficient, cost-effective and coordinated public decision process for siting and managing linear rights-of-way.	Identify existing policies and standards on rights-of-way and corridors.
Ensure that utility and transportation linear right-of-way needs are met in land use planning.	Recommend any new or additional policies or standards.
	Develop an approach to take for corridor planning and establish a process to evaluate corridor areas.
	Develop a coordinated process for joint review of right-of-way proposals.
	Test the developed approach and processes.

Source: State of Montana/USDI/USDA, 1980.

efforts are an important factor for the federal agencies. However, national efforts to expedite corridor planning would be counterproductive if they proceed without state involvement. The form that this involvement can or should take will require careful consideration.

In addition to the FS and BLM planning activities, the Western Interstate Energy Board (WIEB) received a grant from the FS and BLM to study legal and regulatory problems in each of the western states with the intent of streamlining joint state/federal right-of-way procedures where possible. The WIEB also is developing a program designed to coordinate intergovernmental reviews of interstate projects on the regional level.

Recognizing the various corridor planning efforts of national, regional and state significance now underway, the Montana corridor study's Work Management Plan was restructured to permit portions of the work originally scheduled in consecutive phases to be undertaken concurrently.

This report presents the results, conclusions, and recommendations of the Montana corridor planning study effort to date. Phase I work has been completed and is contained in Section II. This material includes a discussion of present linear rights-of-way and types of future linear facilites projected for the state in the next ten years; reviews of agency and right-of-way user policies and authorities; a look at technical and engineering compatibility factors influencing facility locations; and an assessment of social and land use issues associated with right-of-way siting. Other agencies and industry reviewed this material in a draft form during May 1981. Comments received by July 15 have been incorporated in this report; comments received after July 15 are in the project working file.

Approaches for corridor selection and alternatives for implementation are presented in Section III of this report. Section IV contains the conclusions reached in the overall study effort to date and recommendations for the next steps that should be taken to implement a joint intergovernmental corridor planning and evaluation effort for federal lands in Montana. Appendix A contains the list of organizations contacted during the preparation of this report. Appendix B explains the deviations from the Work Management Plan, while Appendix C outlines the original Phase I work agreed to by the agencies.

SECTION II—ASSESSMENT OF THE LINEAR FACILITY SITUATION IN MONTANA

BACKGROUND AND STUDY PROCESS

In this section, locations of and management considerations for existing and projected linear facilities in Montana have been identified according to the following three objectives: (1) establish an interagency corridor planning steering committee, a work team, and a system of contacts with industry, landowner, and citizen groups; (2) document, through maps and text, the existing linear facility situation and provide insight into future linear right-of-way needs in Montana, and (3) analyze existing authorities, responsibilities, and policies for siting linear facilities in Montana.

Interagency coordination began with selection of a project manager and creation of a study team. The team began work in October 1980. As one of its first actions, the team sent informational letters to organizations directly or indirectly involved in the location and management of linear facilities in Montana. In most instances, personal contacts followed to obtain more detailed information on placement and management of facilities and considerations weighed in making right-of-way decisions.

The work team identified the few existing studies and reports which have examined the subject of right-of-way management and the potential need for future linear facilities in the region. In 1975, BLM released a corridor study entitled *The Need for a National System of Transportation and Utility Corridors*. In examining the topic of technical compatibility of various types of linear facilities in joint use rights-of-way, the study concluded that planning corridors with flexible boundaries are necessary, but that "...until further statistical, technological, and environmental data are available from government, industry, and the public sector, ... rights-of-way decisionmaking must continue on an ad hoc basis" (USDI 1975).

In 1977, the BPA and Region 1 of the FS jointly produced a study entitled *Potential Energy Corridor Requirements for the Pacific Northwest (1985-2020)* The study projected energy growth in the Pacific Northwest Region based on historical figures and estimated east-west energy transportation requirements for the coming decades (USDA, USDOE 1977). Later that year, the BPA produced a study, entitled the *Pacific Northwest Long Range East-West Energy Corridor Study* that showed potential corridor locations in Montana identified primarily on engineering feasibility for those electric transmission lines which might be needed in the Pacific Northwest (USDOE 1977).

In 1979, the Western Utilities Group (WUG), an organization of investor-owned utilities in eleven western states, became concerned over the exclusion of public lands for right-of-way use through land use designations such as wilderness. In May 1980, the WUG completed its own inventory of existing and projected corridor areas in Montana. This study was furnished to the BLM and the FS for use in their corridor planning efforts but did not contain sufficient detail to identify possible corridor areas (WUG 1980).

The work of these previous studies, examination of projected future facility needs, and communication with industry highlights the complexity and uncertainty involved in planning for right-of-way needs. This uncertainty is reflected in much of the discussion that follows.

DEFINITIONS

Because some terms pertaining to corridor planning are used differently by various agencies and persons, a set of uniform definitions of terms and concepts is needed. The following definitions will be used in this study. A glossary containing additional terms can be found at the end of this document. A **right-of-way** refers to a strip of land designated through easement, special use permit condemnation or fee ownership as the location for a specific linear facility. **Corridor** is a general term referring to a tract of land much broader than a right-of-way through which one or more existing or potential linear facilities may be placed. The term corridor often implies a long linear area corresponding to the length of a facility. However, corridors also can be short segments or refer to varying widths of land defined by topography or other features as discussed further below.

Various kinds of corridors are differentiated by their use. They include "planning corridors," "defacto corridors," and "designated corridors."

Planning corridors are generally broad rather than narrow areas used to evaluate where specific rights-of-way should be placed. A planning corridor is usually identified in conjunction with an environmental impact statement and evaluation of a specific project proposal.

De facto corridor is a term used to describe an area in which one or more linear facilities already exist. Such a land use pattern probably developed in response to considerations such as topography and ease of access which prompted closely parallel rights-of-way. This pattern probably did not develop with the intent of establishing the best corridor based on environmental considerations. Planning and defacto corridors have the general characteristic of a long linear corridor.

In contrast, a **designated corridor** is a linear area of land with legally defined and recognized boundaries and capacities and which has been determined through study to have environmental or engineering advantages over other areas for the location of present or future rights-of-way. Designated corridors are identified by legal public notice. The term designated corridor may refer to either a short or long strip of land with a defined width.

Windows are short, often narrow, passageways through constrained areas which are the most feasible potential locations for linear facilities, considering engineering and/or environmental factors. A mountain pass through which facilities may be routed is a typical window, although constraints are not limited to topography and may include water bodies and other features that present barriers to or are less suitable for siting. **Exclusion areas** are those areas which linear facilities would not be legally permitted to cross, while **avoidance areas** are areas that pose particular environmental impacts which would be difficult or impossible to mitigate or have characteristics which impose unusual engineering constraints. It is assumed that these areas will normally not be crossed; extra costs and mitigating measures would be required if they were crossed. These areas can be used to identify a corridor either directly or indirectly by the land management agencies. Direct and indirect methods for identifying corridors are explained in Section III.

CHAPTER 1—EXISTING AND PROJECTED LINEAR FACILITIES IN MONTANA

This assessment of linear facilities in Montana analyzes past development patterns and speculates on future right-of-way location and management problems.

The following types of existing and potential linear facilities were mapped using information from agency files and industry: (1) existing electric transmission lines larger than 69 kilovolts and electric generating sites of 50 megawatts or larger; (2) existing crude oil, natural gas, and refined products trunk pipelines greater than 6 inches in diameter and existing refineries and natural gas plants; (3) existing microwave and radio sites, telephone land lines, highways and railroads; and (4) any proposed future facility that would fall into the above categories (see Appendix C). These maps will be on file at the offices of each participating agency.

The present configuration of linear facilities in Montana has been influenced by factors such as topography, resource location, ownership, population centers, and markets. These factors and the way they have influenced present facilities are discussed below.

Transportation Facilities

The configuration of highways and railroads is best understood from a historical perspective. The state's system of highways and railroads developed to provide a transportation network between the state's major population centers and to meet the needs of interstate commerce, particularly the flow of agricultural products. The railroads and highways are also important to national security.

Highway Systems

Highways can be classified under the general categories for federal aid: interstate, primary, and secondary. Interstate highway systems are part of the formally declared interstate system and are recognized as integral parts of the national defense system. With definite and specific standards, they are the major routes of travel between states. Interstate Highways 90 and 94 run east-west across Montana. Interstate Highway 15 runs north-south through western Montana and is a major international link between the United States and Canada. Primary highways, which also link states, and secondary highways criss-cross most of Montana, connecting cities and towns throughout the state and providing an extensive system for intrastate travel.

Although much of the planned highway system is currently in place, upgrading existing roadways in the state and purchasing of rights-of-way to accommodate system expansion will be necessary. Changes in the existing system will probably be limited to these actions.

Railroad Systems

Montana's rail system connects most major cities or agricultural centers in the state. Generally, the mainline system runs east-west, with major rail spurs connecting those centers that lie to the north or south.

It is difficult to accurately assess the future need for increased rail service in Montana. Presently there are no plans for new mainline rail construction or expansion in the state. Actually, a downgrading of the present system is taking place. The mainline Chicago, Milwaukee, St. Paul and Pacific Railroad System (known as the Milwaukee Road) in much of western Montana, and some existing spur lines throughout the state have been abandoned (DOH 1980). Burlington Northern also has announced plans to abandon almost 700 miles of its spur lines in the state. Such moves to abandon parts of the existing rail system may conflict with projections for increased coal development in Montana and burden remaining east-west mainline rail service. The magnitude of this impact is hard to project. There are, however, at least two proposals for coal hauling rail spurs into areas of eastern Montana that suggest a future need for transportation facilities to accommodate increased coal production.

Construction of rail spurs into coal areas which previously had no rail systems may increase the possibility that other forms of development also occur. For example, greater access could encourage proposals for on-site electrical generation, coal gasification, and associated mining activities. Such development may then require new linear facilities to transport electricity or synthetic fuels from plant sites. Although greater access by rail to remote coal areas of Montana may indirectly stimulate the need for other linear facilities, most notably electric transmission lines and pipelines, the magnitude of future right-of-way needs resulting from such secondary development cannot be accurately assessed.

If coal production expands to the point that the mainline and spur rail systems cannot handle the increased supply, other more economical forms of transportation such as coal slurry pipelines may be proposed. These are discussed more fully under the pipeline section of this chapter.

Utility and Other Industry Facilities

The pattern of utility and other industry facilities in Montana is based on intrastate and interstate systems for transporting electricity, crude oil, natural gas, and refined petroleum products. There are also telephone cable, microwave and radio communications located in conjuction with other systems or adjacent to other linear facilities. These systems and possible future needs for additional facilities are discussed in the following subsections.

Electric Transmission Line Systems

Montana is supplied with electricity from a variety of public and private sources, including hydroelectric and thermal generation owned by Montana Power Company (MPC), Puget Sound Power and Light (PSPL), and Montana-Dakota Utilities, and federally owned hydro-

electric power marketed by the Bonneville Power Administration (BPA), and Western Area Power Administration (WAPA). Most of the state is electrically interconnected with the Pacific Northwest with limited interconnection to the Southwest. Portions of eastern Montana are electrically separated from the western parts of the state and are tied to the Dakotas and the Midwest.

Electric transmission lines from federally owned Libby Dam on the Kootenai River connect with the regional grid at Conkelly and Noxon. On the South Fork of the Flathead River, Hungry Horse Dam, also federally owned, connects with the regional power grid near Hot Springs. Electrical generation from dams on the Missouri near Helena and Great Falls, with the exception of the federally owned Canyon Ferry Dam, is produced by MPC. Noxon Rapids Dam on the Clark Fork River is owned by Washington Water Power Company and supplies power needs in Idaho and Washington. Transfers of generation capacity between eastern and western grid systems in the state are possible only at two points in the system, Fort Peck Dam on the Missouri River near Glasgow, and Yellowtail Dam on the Big Horn River south of Hardin. Older thermal electric generation units in the state are owned by MPC or MDU. Colstrip Units 1 and 2 are jointly owned by MPC and PSPL. Colstrip Units 3 and 4 are owned by MPC and a consortium of west coast utilities. Ownership is a partial indicator of where power produced in the state is used. Electrical loads in the state are served by private utilities such as MPC, MDU, and Pacific Power and Light, by rural electric cooperatives (RECs), and, in the case of Anaconda Aluminum and Stauffer Chemical, by BPA. The RECs purchase power from BPA, WAPA, and from Basin Electric Cooperative.

Table 2 lists electric transmission facilities, liquid fuel pipelines, and energy-related water pipelines projected for Montana during the 1980s. The decrease in the growth of electrical energy demand during the 1970s could eliminate or postpone the need for some of these facilities and for many of the corridors projected by BPA (USDOE 1977). At present only one new major thermal electric generating facility is projected for Montana during the next ten years. It is expected to require only a short transmission line to tie into the nearby grid system. Upgrading existing hydroelectric sites for additional generating capacity and constructing new generation facilities on existing dams may occur. Several proposals for hydroelectric projects already exist in western Montana and additional proposals in both eastern and western Monana may be forthcoming.

Many complex factors influence the demand for various energy forms and associated transportation systems. Price and availability of alternative fuels are important economic factors. The recently created Pacific Northwest Regional Power Planning Council also has an important influence. The Council will be preparing a plan over the next two years which will essentially determine the need for future energy generation facilities. Location may be implied to some degree by the types of facilities deemed necessary and the associated requirements for transmission facilities. If generating plants are located at the load center (i.e., shipment of coal by rail, or slurry, to a generation plant located near a population center) rather than at the mine mouth (i.e., coal-fired generation plants at or near the coal mine), the demand for major interstate electric transmission lines could decrease. However, this trend might increase the need for coal transportation facilities such as railroad systems or slurry pipelines.

Pipeline Systems

Interstate pipeline systems reveal a pattern that extends south from Canada and north from Wyoming, areas from which Montana has imported oil and gas in the past.

The patterns of interstate crude oil pipelines are generally related to the location of refineries in areas like Shelby and Great Falls to the north and Laurel and Billings to the south. A network of oil pipelines links these cities. Another system of oil lines extending north and south in the far eastern part of the state transports oil to the east and south. Pipelines also extend from oil fields to the main network.

A system of refined petroleum product pipelines extends from Billings. The 10-inch-in-diameter Yellowstone pipeline transports products from refineries in Billings and Laurel to markets in western Montana and on to Spokane, Washington. A line from Cody, Wyoming extends north to Billings and connects with the Yellowstone pipeline. At Helena, a smaller pipeline branches north from the Yellowstone line to the Great Falls area. A refined products pipeline 8 inches in diameter extends east and north from Billings to Williston, North Dakota. Also, an 8-inch-in-diameter line extends south and east from Billings to Sinclair, Wyoming.

Interstate natural gas pipelines exhibit much the same pattern as interstate crude oil pipelines. Intrastate gas pipelines generally extend from major population centers like Glendive, Billings, Great Falls, Helena, Butte, and Missoula to smaller cities across the state, and connect with the main distribution network from producing fields.

The last several years have seen a sharp increase in oil and gas development in Montana, particularly in the Williston Basin of northeastern Montana and western North Dakota. Such development has resulted in construction of a number of intrastate pipelines to tie into existing oil and gas transportation systems moving crude oil and natural gas to markets in the East and the South. Substantial increases to crude oil production from new finds or greater development of existing fields may exceed the capacity of present transportation systems, resulting in expansion of existing systems or construction of new pipelines.

TABLE 2

Projected Major Linear Facility Projects in Montana During the Next Ten Years

LOCATION	LENGTH	SPONSOR	CONSTRUCTION
	500 KV TRANSMISSION LINES		
Townsend-Garrison (double circuit)	93 miles	BPA	by 1983
Garrison-Spokane (double & single circuit)	160 miles	BPA	by 1984
	230 KV TRANSMISSION LINES		
Columbia Falls-Hot Springs	73 miles	BPA	unknown
Fort Peck-Wyoming	unknown	Basin Electric	unknown
Alkali Creek-Laurel	21 miles	MPC	1984-85
Garrison-Helena	50 miles	MPC	1985-86
Helena-Great Falls	80 miles	MPC	1989-90
Ovando-Missoula	60 miles	MPC	1987-88
Thompson Falls-Pine Creek, ID	unknown	Washington Water Power	1983-84
Libby-Bonners Ferry (double circuit)	45 miles (in Montana)	BPA	by 1983
Flathead Reinforcement	64 miles	BPA	by 1985
Wilsall-Chrome Junction	45 miles	MPC	1984-85
	161 TRANSMISSION LINES		
Dillon Area	10 miles	MPC	1984-85
Fort Peck-Havre	160 miles	WAPA	1983
	110/115 KV TRANSMISSION LINES		
Laurel-Bridger "B"	33 miles	MPC	1984-85
Roundup-Sumatra	50 miles	MPC	1986
Missoula-Hoerner Waldorf	9 miles	MPC	1985-86
Billings Area (upgrade)	12 miles	MPC	1984-85

TABLE 2 Cont.

LOCATION	LENGTH	SPONSOR	CONSTRUCTION
Anaconda-Drummond	53 miles	MPC	1986-87
Plains-Superior or St. Regis	25 miles	MPC	1988-89
Stanford-Glengarry	35 miles	MPC	1983
Benchland Tie	13 miles	MPC	1984
Conrad-Cut Bank	40 miles	MPC	1984-85
Great Falls-Conrad	63 miles	WAPA	1982
Idaho-West Yellowstone	10 miles	BPA	1982
COAL SLURRY AND CRUDE OIL PIPELINES			
Miles City to West Coast (Coal Slurry)	550± miles (in Montana)	Pacific Hydrocarbon Energy Co.	unknown
Northern Tier (Crude Oil)	630 miles (in Montana)	Northern Tier Pipeline Co.	unknown
WATER PIPELINES (All in Eastern Montana)			
Yellowstone to Wyoming	20± miles	Jan Paul	unknown
Powder River	10± miles	Intake Water Co.	unknown
Beaver Creek	10± miles	Intake Water Co.	unknown
Yellowstone	20± miles	Intake Water Co.	unknown

Source: DNRC, 1981.

An overall assessment of future pipeline right-of-way needs cannot be made with certainty. The state's oil and gas industry believes the existing transportation system for refined petroleum products currently is adequate. Existing crude oil and natural gas transportation systems may be adequate in the future, depending on the success of exploration and eventual development of fields. Portions of the western third of the state are within the Overthrust Belt, a geological disturbed area. This region has yielded significant quantities of hydrocarbons in both Alberta and Wyoming, while Montana has remained largely unexplored. The potential for major new finds of oil and gas in Montana is still relatively uncertain. However, improved exploration technology and rising prices have spawned increased interest in the Montana Overthrust area. Hundreds of thousands of acres of private, public, and state-owned lands in the Flathead, Mission, Blackfoot, Missoula, Bitterroot, Deer Lodge, and Big Hole areas have been leased or are under lease application. If exploration of the Overthrust Belt in Montana is successful and development occurs, a need for major new pipeline transportation systems is likely, depending on either the ability of area refineries to absorb the increased supply and the capacity of existing pipeline systems to transport the products to out-of-state markets, or the necessity to ship new supplies to refineries further south into Wyoming and Utah.

Future synthetic fuel development in eastern Montana could increase pipeline transportation needs. In fact, the demand for synfuel products in areas to the east and south may put pressure on existing pipeline systems even without increased oil and gas development in the Williston Basin. Several synthetic fuel plant sponsors have expressed an interest in tying into the Northern Border Pipeline to transport synthetic natural gas (DNRC 1980a).

Coal slurry pipelines and other commodity pipelines also represent potentially major future demands for linear rights-of-way. Coal slurry involves mixing coal with a fluid, usually water, and transporting the mixture through a pipeline. Various proposals have been made to link south-central Montana coal fields with large generating sites or other use centers to the south and west by coal slurry lines. Slurry pipelines face two major obstacles—the lack of eminent domain authority for securing rights-of-way on private land, and restrictions on using Montana water for coal slurry. Under Montana law, interstate coal slurry pipelines are specifically excluded as a beneficial use of water; intrastate coal slurry lines are permitted, however. Railroads oppose slurry lines due to the competition they represent.

The technical and economic feasibility of transporting energy and agricultural commodities through slurry lines may become more of a factor in the future development and transportation needs of the nation. Thus, the State of Montana's preference for exporting coal to load center sites through existing transportation modes and its opposition to supplying water for interstate coal slurry lines may be more at odds in the future. It should be recognized that slurry pipelines and oil and gas pipelines, in many cases, require substantial amounts of electric power to drive pump or compressor stations, which results in a demand for expansion of generation, transmission, and distribution systems to supply the electric requirements of these facilities.

Communications Systems

Communication facilities are concentrated in the populated areas of the state. The telephone subscriber landline system extends from most major cities in Montana for about 20 miles. These lines generally parallel paved roads for ease of access and maintenance. Microwave systems and toll cable facilities are used to link the state's major cities and for long distance calling. The state's highway department and the Montana Highway Patrol have a small system of microwave towers and radio sites. Both the Bureau of Land Management and the Forest Service have a system of radio sites to serve their own statewide communication needs. Also, utilities, power marketing agencies, railroads, and pipeline companies use radio and other communication systems in conjunction with their system's operations.

The present linear communication system in Montana is not expected to expand significantly. Growth which does occur will probably reflect increases in population, and changes in technology. Construction of microwave or radio communication facilities in conjunction with pipelines and electric transmission lines is expected. Because communication systems technology is rapidly advancing, it is not possible to accurately predict what communication rights-of-way needs will be in the future. Telephone cable communications and microwave and radio facilities are not expected to greatly influence linear right-of-way or corridor decisions.

Situation Analysis

The patterns of facility placement in Montana have been influenced by resource location, market locations (both interstate and intrastate) and topography. In the mountainous western third of Montana, facilities are concentrated in river valleys and lower elevation mountain passes. Topographic and economic limitations define where facilities could easily be placed and where engineering design requirements could be accommodated. For example, highways and railroads were placed in these areas due to grade limitations. Electric transmission lines, pipelines, and communication lines have been built near these facilities because the locations offered easy access for construction and maintenance or were primary routes for crossing the mountains. The location of cities and towns also has been a factor in this pattern. In the eastern half of the state, topography is much less of a constraining factor. However, highways, railroads, communication lines, and some electric transmission lines and pipelines have

been located together for easy access and maintenance even where these routes were not the shortest for some facilities. These groups of existing facilities have, in effect, created de facto corridors. Indications are that increased construction costs will influence future placement of electric transmission lines and pipelines; companies will seek straighter and, therefore, shorter routes in the eastern part of the state and, where feasible, in the mountainous part of the state. Engineering constraints on facilities are further discussed in Chapter 4.

In addition to topographic factors and past trends in facility siting, interstate and intrastate utility/transportation facilities connect the major urban centers of the state. In some cases, urban areas have expanded and now pose land use constraints on the siting of future facilities.

After a preliminary examination of the facility inventory, twenty-one areas in Montana that exhibit possible constraints or controls for the placement of new facilities due to potential land use conflicts or topography were identified. These areas are shown on Figure 1. A preliminary reconnaisance level of review of the problems associated with placing future facilities through these areas also has been completed and is on file at the Montana Department of Natural Resources and Conservation in Helena. The identificatation of other possible problem areas at a later date has not been precluded by this initial inventory. This material is to be used for future corridor planning and management efforts in Montana as outlined in later sections of this report. A more detailed discussion of general land use and other social issues important to right-of-way planning is presented in Chapter 5.

A major source of conflict in areas with rights-of-way is that incompatible land uses have often occurred since existing facilities were sited. Thus, in some areas the location of existing facilities may not be the best location for establishing a corridor.

Figure 2 shows the pattern of facilities through and around Billings. Constraints on facility placement in this area are primarily related to land use. Avoiding residential areas and possible conflicts with future residential growth could make routing through Billings difficult, while routing around the city may create conflicts with agricultural land use.

Figure 3 shows the pattern of existing facilities between the cities of Anaconda and Deer Lodge. Facility location is not severely constrained by land use or topography in this area. However, conflicts surrounding the area's resources may surface as new facilities are sited in the hills and mountains surrounding the valley.

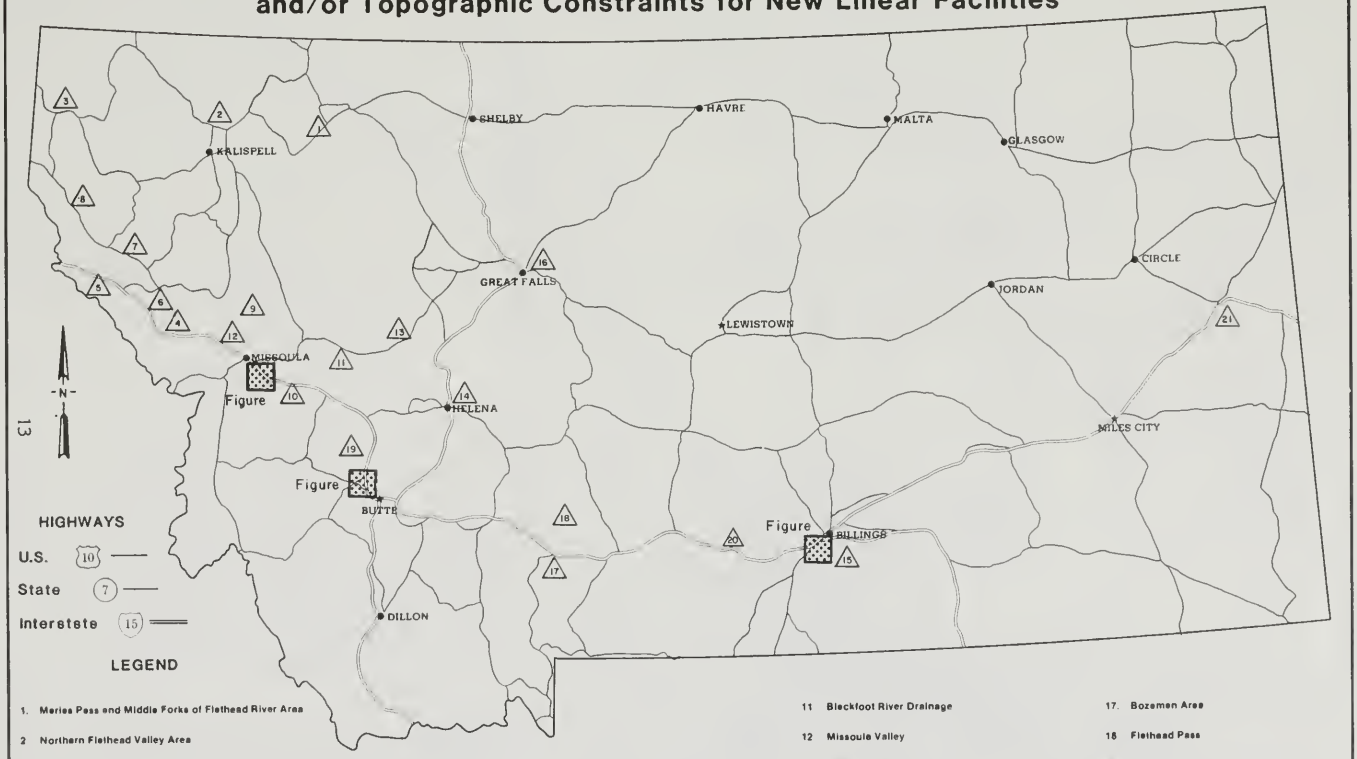
Figure 4 shows the pattern of existing facilities as they enter and leave the Missoula area. New facility location is severely constrained by topography and land use. East of Missoula, the Clark Fork River Valley is quite steep and narrow before the canyon opens into the Missoula Valley. The city of Missoula poses a constraint to placement of facilities along the valley floor from east to west. By-passing to the north of Missoula is complicated by existing patterns of land use, notably the Rattlesnake Wilderness Area and Rattlesnake National Recreation Area. South of Missoula new facilities could conflict with land use and topography in the upper part of the Sapphire Mountain range. The importance of these constraints is heightened by the fact that the Clark Fork Valley is one of the major low elevation routes across the mountains of western Montana.

Existing facility locations are only one factor in evaluating or assessing the linear facility situation in Montana. The type and number of new rights-of-way that may be needed also is an important factor. Electric transmission lines are the most probable type of new facility that may be needed in Montana over the next decade (see Table 2). There are also projections for new pipelines, especially if exploration for oil and gas continues and increased development of Montana oil, gas, and coal occurs.

Although both intrastate and interstate rights-of-way may be expanded, the number of facilities that will be needed depends on the following types of unresolved questions: (a) How and in what form will energy from the Montana-Wyoming coal fields be moved to use or export centers? (b) How much future hydroelectric generation expansion will occur and where it will be located? (c) What impact will conservation have on future energy demand and energy use? (d) What impact will upgrading or rebuilding existing electric transmission facilities have on new right-of-way needs? (e) What will be the future demand for electricity? (f) What types of transportation systems will be needed? (g) What emphasis will be placed on mine-mouth versus load center electrical generation? (h) How will technology affect right-of-way needs?

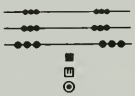
FIGURE 1

Areas in Montana with Land Use and/or Topographic Constraints for New Linear Facilities



LEGEND

ELECTRIC TRANSMISSION AND GENERATION



ELECTRIC TRANSMISSION LINES
- 100, 115, 161 KV
- 230 KV
- 500 KV

MAJOR SUBSTATIONS

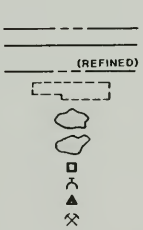
HYDRO-ELECTRIC GENERATION

THERMO-ELECTRIC POWER PLANTS ≥ 50 MW

OWNERSHIP

M.P.C.	MONTANA POWER COMPANY
B.P.A.	BONNEVILLE POWER ADMINISTRATION
P.P.L.	PACIFIC POWER AND LIGHT
W.W.P.	WASHINGTON WATER POWER
W.A.P.A.	WESTERN AREA POWER ADMINISTRATION
M.D.U.C.	MONTANA-DAKOTA UTILITIES COMPANY
N.L.	NORTHERN LIGHTS
G.E.C.	GLACIER ELECTRIC COOPERATIVE

FUELS TRANSMISSION AND PRODUCTION



PIPELINES > 6 in. DIA.

OIL

NATURAL GAS

REFINED PRODUCTS

OIL & GAS FIELDS (Border)

OIL FIELD

GAS FIELD

OIL REFINERIES

GASIFICATION PLANTS

COMPRESSOR AND PUMP STATIONS

COAL MINES

OWNERSHIP

MPC	MONTANA POWER COMPANY
MDUC	MONTANA-DAKOTA UTILITIES COMPANY
NN	NORTHERN NATURAL
	CENEX

TRANSPORTATION AND COMMUNICATION

INTRA-CITY TELEPHONE TRUNKS:
- MOUNTAIN BELL - EXISTING LAND LINES

MICROWAVE RELAY STATIONS

PASSIVE MICROWAVE RELAY

RADIO SITES
- HIGHWAY DEPT.
- FOREST SERVICE
- HIGHWAY PATROL

RAILROADS

MAJOR PAVED COUNTY, STATE, FEDERAL ROADS

ABANDONED & "NOT USED" RIGHTS-OF-WAY

FIGURE 2

Pattern of Facilities in the Area of Billings

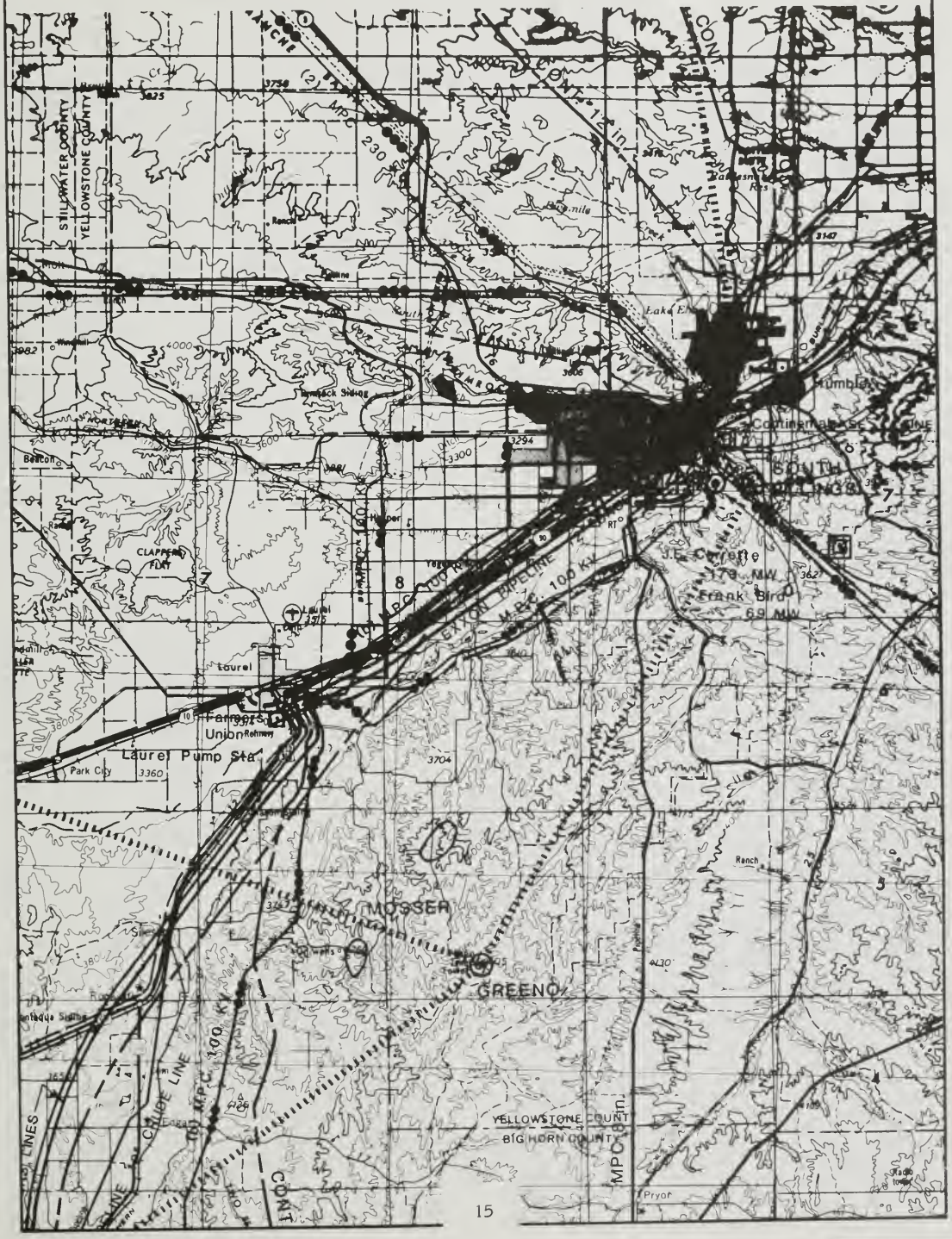


FIGURE 3

Pattern of Facilities in the Area of the Deerlodge Valley Between Anaconda and Deerlodge

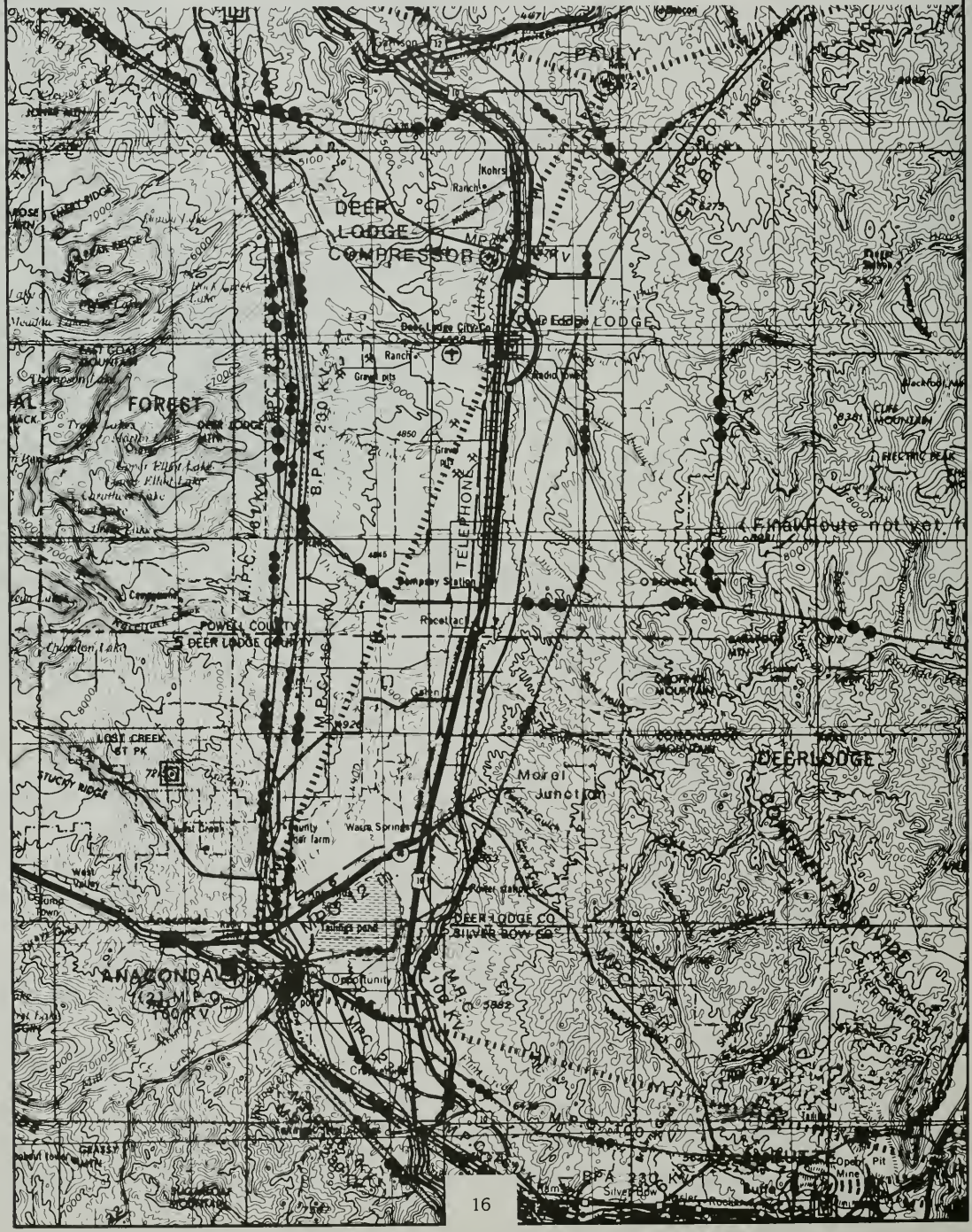
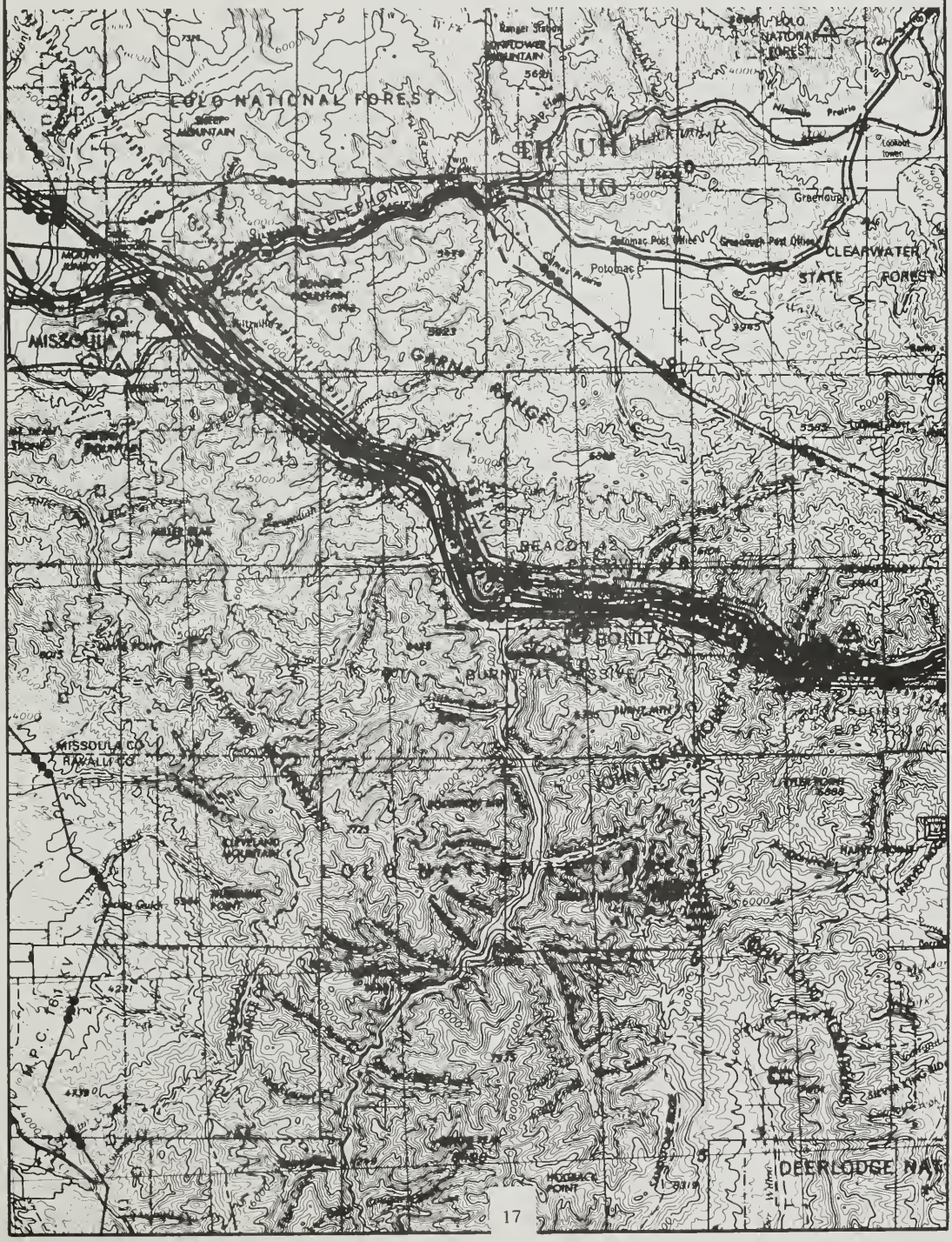


FIGURE 4

Pattern of Facilities in the Area of Missoula



CHAPTER 2—THE REGULATORY, LAND MANAGEMENT, AND FACILITY SITING SITUATION

The following discussion outlines the responsibilities of state and federal agencies when making right-of-way siting decisions and identifies potential problems for joint corridor planning in Montana.

Statutes

A distinction exists between the siting of individual projects over which government agencies have authority and authority to designate corridors. As the following subsections will show, the different responsibilities of state and federal agencies affect the types of corridor planning and management decisions these agencies can make.

State of Montana

Montana's legislature has not passed any law which authorizes the state to designate utility and transportation corridors. State agencies are authorized to grant a number of permits and to site certain facilities such as electric transmission lines before construction of a facility can begin. These actions are triggered once an application for a permit, easement, or a siting certificate is received by an agency. Actions by state agencies to permit or site linear facility projects are carried out under the guidance of either Montana's Environmental Policy Act or Major Facility Siting Act.

Montana Environmental Policy Act (MEPA)

The MEPA is a broad law which requires state agencies to assess and minimize the environmental consequences of their actions. An environmental impact statement (EIS) must be submitted for projects which have been determined to require major state actions—those that significantly affect the quality of the human environment (MCA 75-1-101 et. seq.). If an EIS is necessary, state permits are not granted until a final EIS has been issued. Examples of the types of state permits possibly required for a linear facility are summarized in Table 3.

The main agencies with individual permitting responsibilities that affect linear facilities are the Department of State Lands (DSL), Department of Highways (DOH), and the Department of Fish, Wildlife and Parks (DFWP). DSL, under the departmental Enabling Act, is responsible for maintaining the revenue producing potential of state owned forest and school trust lands. The Board of Land Commissioners reviews right-of-way requests on a case-by-case basis and is authorized to grant easements across state school trust lands for "public uses." The DOH's primary responsibilities are the administration, planning, location, engineering, design, construction, maintenance, and protection of the state's highway system and granting easements in or across highway rights-of-way. The DFWP is responsible, in part, for advising on stream crossing permits and for protecting fish and wildlife resources. The responsibilities of these agencies influence how right-of-way decisions on the state level are made and will be referred to in later sections of this chapter.

Major Facility Siting Act (MFSA)

The MFSA gives the Department of Natural Resources and Conservation (DNRC) and Board of Natural Resources and Conservation (BNRC) primary responsibility to review siting and construction proposals for certain facilities that would generate, convert, or distribute energy. In contrast to the individual permit authorities of other agencies, MFSA confers comprehensive authority for the siting of facilites. Linear facilities covered by MFSA include:

> —electric transmission lines greater than 69 kV except those lines which are 230 kV or less and 10 miles or less in length.
>
> —pipelines which transport water, liquid, hydrocarbon and gaseous materials, other than crude oil, natural gas or products refined from them, to or from any generation or conversion facility listed in the Act. Refineries are excluded (MCA 75-20-105(10)).

No applicant may construct a facility covered under MFSA without first obtaining a Certificate of Environmental Compatibility and Public Need from BNRC. The certificate, with certain exceptions, eliminates the need to obtain most other state permits. However, MFSA provides for the participation of agencies with permit authority. These agencies essentially conduct the analysis required to grant their permits and such studies are incorporated into BNRC's decision. Highways, railroads, and oil and gas pipelines are not covered by MFSA.

Both MEPA and MFSA require that alternatives to project proposals must be studied. Proximity to existing rights-of-way is a factor considered when comparing and evaluating the alternatives. The MFSA also requires that facilities be sited on national forests and other public lands whenever their use is as economically practicable as the use on private lands and compatible with environmental criteria listed in the Act (MCA 75-20-201(i)).

Federal Land Management Agencies

The FS and BLM have authority to manage rights-of-way for linear facilities crossing federal lands under their jurisdiction through designated corridors, if appropriate. Agency responsibilities and authorities are based on the laws discussed below.

National Environmental Policy Act (NEPA)

National Environmental Policy Act directs that any federal action significantly affecting the environment requires an EIS. Guidance for preparation of an EIS, or environmental assessment for lesser actions, is provided by Council on Environmental Quality (CEQ) regulations. Federal agencies must produce an environmental analysis for a linear facility project proposal. An EIS is required if the agency determines the action to be significant. Proposals affecting more than one agency

TABLE 3

Major State Permit Actions Possible for a Large Linear Facility

ACTIVITY REQUIRING ACTION	FORM OF ACTION	LOCATION	REMARKS
	CITY AND COUNTY GOVERNMENTS		
Construction not in compliance with local zoning or planning	Zoning permit	Area covered by local planning	Local zoning or planning control differs along pipeline route
Construction over county roads	Permit	County roads	Crossing of roads owned by county requires supervision after issuance
	CONSERVATION DISTRICTS		
Construction across perennial streams	Permit	Stream/river	Permit may be granted before construction but monitoring must occur during construction
	DEPARTMENT OF FISH, WILDLIFE AND PARKS		
Crossing of land owned or leased by the Department	Easement	State Lands	Easements can be issued prior to construction but conditioned by DFWP findings
Construction over streams or rivers	Recommendation	Stream/river	Recommendations to conservation Districts, and to USFS for national forests and "404 permit"
Construction affecting wildlife habitat	Recommendation	Key wildlife habitat	Recommendation based on Fish and Wildlife Coordination Act USC 16 66 to 666C
	DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES		
Construction affecting air quality - general	Permit	Construction sites	For petroleum storage and airborne particulates from road construction dust and open burning; issued befor construction but dependent on DHES monitoring
- Open Burning	Permit	Burn site	Review and conditions

TABLE 3 cont.

ACTIVITY REQUIRING ACTION	FORM OF ACTION	LOCATION	REMARKS
Operation affecting air quality	Permit	Compressor Station site	Prevention of Significant Deterioration Permit includes a number of regulatory actions required by the federal Clean Air Act and amendments
Construction affecting water quality - General	Permit	Stream/river	Allows short-term activities which will create turbidity in excess of water-quality criteria
- Discharge test water	Permit		Discharge hydrostatic test water
Construction affecting municipal water sheds	Permit	Stream/river	Contamination of water sources prohibited
DEPARTMENT OF HIGHWAYS			
Construction along and crossing highway right-of-way	Encroachment permit	Highways	Regulates the location of a crossing
Crossing highway right-of-way	Permit	Highways	Permits construction of a ditch across a state or federal road
DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION			
Crossing state water-project land	Easement	State lands	Approval by DNRC Board; Water Resources Division formulates easement conditions
Hydrostatic testing	Water use permit		Any appropriation of water requires water use permits
DEPARTMENT OF STATE LANDS			
Crossing state land	Easement	State lands	Granting of easement may depend on a survey of cultural resources
Crossing navigable river bottoms	Easement	River bottoms	State owned river bottoms require crossing easement
Removal of fill material	Permit	Stream/rivers, quaries, mines	Permit limits amount that can be removed and places certain condition on permittee

TABLE 3 cont.

ACTIVITY REQUIRING ACTION	FORM OF ACTION	LOCATION	REMARKS
	HISTORIC PRESERVATION OFFICE		
Construction affecting historical or other cultural sites	Permit	All lands	Authority over state and signoff authority over federal lands, conditioned upon discovery of any cultural resources during construction

Source: DNRC, 1980

are addressed through a joint agency effort; cooperating agencies may include FS, BLM, the Bureau of Indian Affairs, and any affected Indian tribe if reservation lands are affected by a proposal, and any other agencies with permit authority over any part of a project. When an EIS is needed, a final EIS and Record of Decision must be issued before a right-of-way for a linear facility can be granted.

National Forest Management Act (NFMA)

Planning responsibilities for National Forest System (NFS) lands are outlined in the National Forest Management Act. The NFMA directs that regional and national forest plans be established to achieve national goals and objectives set for these lands. Corridors must be addressed in the plans. The regulations which govern preparing the plans and the treatment of corridors are discussed later. The FS's Northern Region plan for regional and individual forest plan guidance is now being finalized (USDA 1980a, 1980b). Individual forest plans are in various stages of preparation.

Federal Land Policy and Management Act (FLPMA)

Title V of FLPMA covers all utility and transportation facilities that affect public or NFS lands except pipelines for oil and gas, synthetic liquids, gaseous fuels, or refined products. FLPMA covers:

—facilities to store, transport, and distribute water;
—coal slurry or other slurry pipelines;
—electrical energy generation, transmission, and distribution facilities;
—communication facilities;
—transportation systems (i.e., highways and railroads).

Both the FS and BLM have responsibility under this act to manage rights-of-way across lands under their jurisdiction. When a project will cross both NFS and BLM lands, a joint interagency study is needed, but each agency retains its right-of-way responsibilities.

Title V authorizes granting of individual rights-of-way and designation of utility and transportation corridors by either the Secretary of the Interior or the Secretary of Agriculture. Section 503 of FLPMA states, "In order to minimize adverse environmental impacts and the proliferation of separate rights-of-way, the utilization of rights-of-way in common shall be required to the extent practical, and each right-of-way or permit shall reserve . . .the right to grant additional rights-of-way or permits for compatible uses on or adjacent to rights-of-way granted pursuant to this Act. In designating right-of-way corridors and determining whether to require that rights-of-way be confined to them, the Secretary concerned shall take into consideration national and state land-use policies, environmental quality, economic efficiency, national security and safety, and good engineering and technological practices. The Secretary concemed shall issue regulations containing criteria and procedures he will use in designating such corridors. Any existing transportation and utility corridors may be designated as transportation and utility corridors pursuant to this subsection without further review" (43 USC 1753).

1920 Mineral Leasing Act as Amended (MLA)

Title I of Mineral Leasing Act authorizes the Secretary of the Interior, through the BLM, to grant rights-of-way for oil and gas pipelines across all federal lands. Where a pipeline proposal will affect only lands under the jurisdiction of the BLM, the agency head approves a right-of-way grant. If the project affects only NFS lands, the FS has responsibility for issuing the permit. For a pipeline project affecting federal lands under the jurisdiction of more than one federal agency, the Secretary of the Interior may, with approval from the affected agencies, grant a right-of-way over all the involved federal lands. The MLA encourages the utilization of rights-of-way in common to the extent practical (30 USC 185(p)).

Federal Power Marketing Agencies

The Bonneville Power Administration (BPA) and Western Area Power Administration (WAPA) are federal agencies with broad responsibilities for the transmission and marketing of power within specified areas of Montana. BPA operates in the Pacific Northwest in a service area that extends to seventy-five air miles east of the Continental Divide in Montana. WAPA operates in California and all or part of most midwestern and western states, including those parts of Montana not covered by BPA. While BPA and WAPA receive federal eminent domain powers when they construct a transmission line, the two agencies still must comply with NEPA and CEQ regulations when locating and acquiring rights-of-way across federal, state and private lands. For example, BPA has developed a program it follows to meet these requirements when siting a transmission line (USDOE 1979). This policy directs procedural rather than substantive actions. The federal power marketing agencies are in a dual role—they not only function as utilities in marketing and transmitting electricity, but also are involved in right-of-way selection in conjunction with the federal land management agencies. In addition, through the Pacific Northwest Regional Power Planning and Conservation Act of 1980, BPA has been given an important role in decisions to construct future energy generation sources and associated transmission systems in the Pacific Northwest. This statute and BPA's and WAPA's enabling legislation are outlined below. In addition, BPA's transmission planning agreement with the FS and BLM is summarized near the end of this chapter.

Bonneville Project Act

The Bonneville Project Act of 1937 which created the BPA, authorized the agency to construct and operate a regional transmission grid that interconnects generation sources. The agency markets electricity from these sources. Although the federal projects administered

are primarily hydroelectric facilities in the Columbia River Basin, including Hungry Horse and Libby dams in Montana, private generation sources, such as Colstrip Units 3 and 4, are connected to BPA's system. BPA must give preference and priority to public bodies and cooperatives in marketing power.

Energy Reorganization Act

This 1977 law created the U.S. Department of Energy, including WAPA, which took over federal power marketing and transmission responsibilities previously handled by the Bureau of Reclamation.

Pacific Northwest Regional Power Planning and Conservation Act

This 1980 statute created a regional power planning council composed of representatives from the four states in the Pacific Northwest region (Washington, Oregon, Idaho, and Montana) and charged the council to prepare within the next two years, a forecast of the region's energy needs and a plan for meeting those needs. The plan must give conservation and renewable energy sources priority over conventional generation sources. Developing the plan will require close coordination with BPA and the region's utilities. Once the plan is developed, the actions of BPA related to resource acquisition are required to be consistent with the plan. Responsibility for the actual siting of individual facilities is explicitly excluded from the scope of this statute. However, in determining the type of future generation facilities that will be needed in the region, the regional plan will be employed to determine the need for future transmission facilities. Depending on the type and number of generation sources deemed necessary, certain locational considerations will be implicit or at least will follow directly from the findings in the plan.

Rules, Regulations, Standards, and Guidelines

Legislative authorities of state and federal agencies are implemented through rules or regulations which have the effect of law. The key rules or regulations relating to state and federal right-of-way or corridor authority are summarized below.

State of Montana

Montana agencies each have specific rules or regulations that direct actions they take for approving or denying permits or easements.

Department of State Lands

The Department of State Lands classifies land according to use. If a proposed use is determined to be of higher value than the existing use (i.e., it will produce increased revenue for the school trust), a reclassification is possible. A land classification often restricts other types of land use. Agricultural use may receive a higher revenue producing grade than a use for electric transmission line rights-of-way. However, a right-of-way for a pipeline across school lands classified for agriculture can be granted since it would not affect the revenue producing potential of the land. The location for a right-of-way across state owned land always requires an analysis to determine its potential for producing revenue. In granting easements, the State Land Board seeks to minimize disruptions to any existing lessees use of the land primarily agriculture, although common rights-of-way are encouraged wherever possible.

Department of Highways

Highway rights-of-way are purchased across private lands by DOH. Any utility seeking to occupy or cross a highway right-of-way must obtain an easement from the Department of Highways. Although state law requires that utilities be allowed to occupy highway rights-of-way, such use is allowed on a case-by-case basis, considering such factors as minimum safety, proper drainage, vegetation maintenance, debris control, traffic protection and scenic enhancement standards. Because highways are part of the national defense system, this is also a major factor in evaluating joint use proposals.

Department and Board of Natural Resources and Conservation

The MFSA rules detail the information requirements for complete applications and procedural requirements for facility certification. For linear facilities, The Board of Natural Resources and Conservation (BNRC) approves a route subject to conditions placed on the certificate. Detailed centerline studies are then conducted by the project sponsor and the Department of Natural Resources and Conservation. When an acceptable location is chosen, BNRC finalizes a centerline. Once the centerline is approved, a linear facility is placed within a right-of-way of a determined width—width is dependent on each project's requirements such as those for access, safety, and industry standards. No predetermined right-of-way widths have been established by BNRC.

Department of Fish, Wildlife and Parks

The Department of Fish, Wildlife, and Parks plays an advisory role to conservation districts, federal agencies, and state agencies in locating linear facilities. The DFWP makes recommendations for conservation districts on means to protect fish or wildlife before a stream crossing permit is issued.

Federal Land Management Agencies

The FS and BLM regulations for addressing rights-of-way across NFS and other federal lands are similar in intent to DNRC's siting rules but the contents differ.

Forest Service

The Forest Service covers all special uses of NFS lands—e.g., land occupancies, related authorities—under one set of regulations (36 CFR, part 251). Thus,

regulations for granting rights-of-way under FLPMA are found in this part of the federal code and are more substantive than procedural. Conversely, regulations for corridor planning and management are found under the regulations for NFMA.

The National Forest Management Act regulations state that regional plans should require corridors to the extent practicable to minimize adverse environmental impacts caused by the proliferation of separate rights-of-way (36 CFR 210.10b(14)). Further, the regional plans must recommend ". . .transportation corridors and associated standards for forest planning such as standards for corridors, transmission lines, pipelines, and water canals. The designation of corridors is not to preclude the granting of separate rights-of-way over, under, or through the public lands where the authorized official determines that confinement to a corridor is not appropriate" (36 CFR 219.10d(5)).

Guidelines to implement these regulations are currently being drafted. The guidelines will address management of right-of-way corridors on NFS land through regional and forest planning, and will include planning guidance for projecting corridor needs, based on the considerations developed in this report.

Bureau of Land Management

One part of the BLM regulations covers rights-of-way and corridors under FLPMA (45 CFR 2800). Other regulations cover rights-of-way and corridors under MLA (45 CFR 2880). BLM's regulations establish procedures for the orderly and timely processing of applications, grants, permits, amendments, assignments, and terminations for rights-of-way. BLM objectives are to: (1) protect natural resources associated with public lands and adjacent private lands; (2) prevent unnecessary or undue environmental damage to lands and resources; (3) promote joint utilization of rights-of-way when facilities are compatible, and in accordance with national security and land-use considerations; and (4) coordinate fully all actions with state and local government, interested individuals, and other groups (45 CFR 2800).

Right-of-way decisions are made through a case-by-case analysis that takes into account the economic and technical feasibility of alternatives to the facility and its construction. The state director is responsible for determining the level of environmental analysis and issues the right-of-way grant. Right-of-way grants are quite detailed and contain provisions that apply to a specific linear facility.

Corridor designation by BLM is discretionary. Designating a corridor would not preclude granting a right-of-way outside the corridor if confining it to the corridor would be inappropriate. Under BLM regulations, existing transportation and utility rights-of-way that could accommodate additional compatible facilities may be designated as corridors without further review. Further, the regulations encourage placement of subsequent rights-of-way in designated corridors when practical. New rights-of-way in a corridor would be approved through standard agency grant procedures.

Corridor designation would be made after a thorough review of several criteria. These criteria include factors such as: (a) federal, state, and local land-use plans and applicable federal and state laws; (b) environmental impact; (c) physical effects and constraints on a corridor or placement of rights-of-way; (d) economic efficiency of a corridor; (e) national security risks; (f) health and safety hazards; (g) engineering and technological compatibility; and (h) social and economic impacts on public land users, adjacent landowners, and other groups (45 CFR 2806.2). Designation procedures must be consistent with BLM's land-use plans.

Federal Power Marketing Agencies

The BPA and WAPA must comply with all federal environmental statutes, executive orders, and Office of Management and Budget circulars. THE BPA, for example, has developed a "checklist of 16" (1981) which lists the levels of review and permits required for its proposals.

Policies

Policies of state and federal agencies on rights-of-way or corridors differ according to the agencies' responsibilities.

State of Montana

While no state law deals with corridor designation, agencies can create de facto corridors by granting permits, easements, or approval for individual linear facility routes. The Major Facility Siting Act and the Montana Environmental Policy Act provide vehicles for agency recommendations and Board of Natural Resources and Conservation decisions.

Board and Department of Natural Resources and Conservation

The BNRC can approve a transmission line route which parallels or jointly uses an existing right-of-way and adopted a policy to approve parallel routes whenever appropriate (DNRC 1976a, 1976b, 1978). This policy is followed during route and centerline studies that DNRC conducts for a particular facility. Parallel or joint use rights-of-way were recommended by DNRC in EIS's for the Northern Tier and Northern Border pipeline projects (DNRC 1980b, 1980c). It should be noted that these two projects were evaluated under MEPA; therefore, there was no authority to approve or disapprove an overall route for these lines.

Other State Agencies

Other state agencies contribute to right-of-way decisions under policies for granting permits or easements to individual projects. DOH's policy is to allow joint use of highway rights-of-way on a case-by-case basis when

factors such as national security, public safety, and aesthetics are not jeopardized. Department of State Lands follows a policy of siting transmission lines on the periphery of school trust lands wherever possible so that they will not interfere with other uses of the land. The Department of Fish, Wildlife and Parks takes a more drastic stance on right-of-way locations. Because it feels that fish and wildlife often receive low priority in siting decisions, the Department of Fish, Wildlife and Parks objects to rights-of-way that adversely affect fish or wildlife resources. Unless overall coordination of these agencies' areas of responsibility occurs under auspices of an MFSA project evaluation, or a joint interagency MEPA evaluation, the overall effect of individual agency permit or easement decisions on a project is usually small.

Federal Land Management Agencies

The FS and BLM currently make corridor-related decisions through reviews for individual projects over which they have authority. As such, the policies of the FS and BLM are primarily directed toward permitting procedures and not specifically toward the designation of corridors. Specific, substantive, corridor designation policies have not yet been developed. The following sections discuss important corridor-related policies of the two federal land management agencies.

Forest Service

The Forest Service approval of rights-of-way is directed by the policy that uses of NFS lands should meet legitimate public needs. Right-of-way uses of NFS lands are permitted if they are carried out compatibly with established multiple-use goals and objectives developed in forest and regional land management plans.

A few specific FS policies are important to note. For example, through long-range planning, the FS seeks to assure timely and well-planned location of energy transmission facilities. This includes needed right-of-way planning and management. The FS also encourages industry to develop reliable undergrounding for high voltage powerlines, works with other federal agencies to encourage burial of powerlines within highway rights-of-way, and permits and encourages inconspicuous modes of transmitting electrical energy across NFS lands that are compatible with other land uses. The FS's objective is to limit the number of separate electric transmission line rights-of-way on NFS lands to the minimum necessary to meet legitimate public needs and to minimize the environmental impact of those that are permitted (FSM 2728.12).

Forest Service policy for corridor planning and management is to address corridor identification, evaluation, and designation through an interagency approach which is embodied in the Work Management Plan authorizing this study.

Bureau of Land Management

The Bureau of Land Management rights-of-way policies are procedural in nature. For example, BLM follows a policy to process all rights-of-way applications in a timely manner while protecting environmental and other resource values.

The Bureau of Land Management policy for corridor planning and management is like that of the FS. The Bureau of Land Management is following a joint interagency process to determine the need for and appropriateness of designating corridors on public lands in Montana.

Federal Power Marketing Agencies (BPA)

The Bonneville Power Administration right-of-way policies primarily address system interconnections and system reliability concerns. The Bonneville Power Administration is active in these areas through its participation in various Pacific Northwest interregional and national utility organizations actively concerned with reliability of electric power service. In addition, BPA has its own reliability criteria that are designed to assure a specified level of service to electric power users. Through its reliability criteria and the criteria agreed to in utility coordinating and interconnection agreements. The Bonneville Power Administration designs, builds and maintains electric transmission and generation systems or purchases power from available sources. Expansions of the system depend on available supplies of power within the BPA operated system and within the system interties which feed it; a sufficient reserve capacity must be maintained within the interconnected systems to prevent the loss of large amounts of power due to both unplanned and planned outages (USDI 1977). Other factors for BPA and WAPA policy are discussed in Chapter 3.

Existing Interagency Agreements

Several agreements between federal agencies and federal and state agencies have bearing on corridor planning and right-of-way siting. They are discussed below.

MFSA Agreement

A 1976 agreement between the FS, BLM, and the State of Montana concerns the siting of linear facilities covered under the MFSA that traverse federal, state and private lands. This cooperative agreement calls for joint efforts by the participants to review individual projects. The participants have agreed to coordinate individual study efforts on a project basis and conduct joint reviews where feasible. This agreement is one of the catalysts for Montana's involvement in corridor planning and management.

Power Planning Agreement(s)

Proposed locations and projected needs for power transmission on NFS lands within Region 1 are coordinated through FS agreements with the BPA and BLM. These planning efforts are directed toward reducing the number of separate rights-of-way by promoting joint

use where technical compatibility factors or other resource uses do not conflict. A similar agreement with WAPA is being developed.

Highway Siting Agreements

In July of 1976, DOH entered into a certification acceptance agreement with the Federal Highway Administration (FHWA). This agreement allows certain actions to be taken by DOH without FHWA approval on a project by project basis (DOH 1981).

Coordination of highway transportation planning, development, and operation exists between the FS and DOH through a memorandum of understanding. Procedures for coordination are designed to ensure that adequate, efficient, and economic transportation systems are developed. Procedures for location, construction, maintenance, access, and safety of state and federal highways across NFS lands are outlined in these memorandums.

Implications for corridor Planning

As noted in the previous discussion, an important distinction exists between right-of-way decisions and corridor designation decisions. This distinction is a key point of difference between existing federal and state authorities. Right-of-way decisions result from comparative investigations of broad planning corridors of variable width. Identifying and evaluating "planning corridors" are, however, part of project specific reviews which are separate from corridor designation processes.

Federal and state agencies in Montana have focused on making right-of- way decisions through permit, easement, grant, or other certification actions on individual projects. In some cases, like the Colstrip electrical transmission project and Northern Tier Pipeline project, federal and state agencies attempted joint reviews, but, for several reasons, these desirable efforts failed. No procedures for joint project review were developed and the federal agencies and the state operated on their own schedules and procedures. The lack of joint procedures remains a serious problem because of unresolved jurisdictional interpretations. The State of Montana maintains the MFSA requires state approval of the entire route for certain energy projects. On the other hand, federal approval is required where any right-of-way would cross federal lands. Regardless of the legal implications involved, joint review of future projects is considered vitally important to coordinate decisions on projects that cross federal, state and private lands in Montana.

State of Montana

Montana's legislature has not passed a law giving state agencies the authority to set aside areas of state land as utility and transportation corridors. State agencies have the power to influence the location of individual facilities by granting permits or easements and siting certain energy facilities under the MFSA, but these processes are reactive rather than prospective. In addition, comprehensive analysis of facilities not under MFSA depends on the decision that granting permits or easements for a facility would be a major state action. Such a decision would trigger the MEPA environmental impact statement process.

For state government, this situation assessment raises more questions than it answers. Where agencies have specific authority, it is fairly well defined, although litigation is pending to clarify the jurisdiction of MFSA over federally sponsored projects. The Department of State Lands probably has authority to make land use decisions on school trust lands that could include corridors. However, under present law such a decision could not be made if it decreased the revenue producing potential of those lands.

The State of Montana has yet to answer the question of whether it wants to designate corridors. In terms of full public debate and evaluation, the question of state corridor designation authority has not been considered. Past siting discussions in Montana have focused more on large energy conversion and generation facilities than on linear facilities or corridor identification, evaluation, and designation.

Federal Land Management Agencies

Forest Service and Bureau of Land Management direction for corridor planning and management procedures is just emerging. The questions of need for corridors and the feasibility of designating any specific geographic area as a corridor remain largely unanswered.

The Federal Land Management Policy Act, among other laws like Mineral Leasing Act, gave the FS and BLM authority to designate corridors. Recent regulations for implementing this responsibility reflect many of the complexities of the present corridor planning and management situation. For example, utility and transportation corridors are encouraged by law, but designated corridors would not preclude granting a separate right-of-way where the FS or BLM determines such an action appropriate. Criteria for granting rights-of-way outside of a corridor have not been defined. In short, procedures for defining the need, use, and feasibility of designating corridors are not well established.

Existing policies are oriented toward granting individual rights-of-way. Corridor-related policies which do exist relate only to the planning of future facilities as identified in joint interagency planning agreements with BPA and WAPA. There are no specific corridor policies to guide the development of designation procedures.

In summary, the FS and BLM need implementation direction for corridor planning on:

1. purposes, uses of, and need for designated corridors;

2. exceptions to the use of corridors as the preferred location for future rights-of-way;
3. procedures that supplement or modify existing agreements so that joint studies can develop for:

   a. the review of individual rights-of-way;
   b. the review and possible designation of corridors.

Federal Power Marketing Agencies

The implications of the recent Pacific Northwest power planning legislation are not fully known. However, this legislation could have an important bearing on corridor planning needs and efforts in the region.

Whether BPA and WAPA must comply with Montana's MFSA before they construct transmission facilities is a legal question currently the subject of a lawsuit filed by the State of Montana against BPA and the two federal land management agencies. The Bonneville Power Administration, BLM, and the FS have conducted a joint evaluation and right-of-way decision process for the Colstrip transmission project from Townsend westward. Other BPA and WAPA transmission projects presently in the planning stages also would be sited through a joint federal interagency process. State involvement in this process in advance of a decision on the aforementioned lawsuit is currently being discussed. Pending resolution of these matters, BPA and WAPA have been making right-of-way siting decisions on state and private lands in Montana. The role of the federal power marketing agencies as right-of-way users is further discussed in Chapter 3.

Problems and Paradoxes

In addition to the conclusions noted above concerning the respective state and federal statutory and policy situations, there are a number of problems, apparent paradoxes, and gaps in the laws or policies which must be addressed before common federal/state direction for corridor location and management is possible. These are discussed individually below.

1. The Federal Land Management Policy Act authorizes designation of corridors "without further review" where existing facilities are already present on federal lands. This law stresses federal dominance on public lands and shows a lack of emphasis toward intergovernmental efforts to solve public and private land ownership dilemmas. Inverse condemnation of private lands is a major problem which may be intensified by aspects of existing law. Other federal legislation and guidance provided by regulations and policy stresses the importance of coordinating action on federal lands with entities responsible for adjacent land and, where appropriate, using an intergovernmental decision process. This contradiction exists between statutes, between the policies of different agencies, and between different policies within a single agency. State and federal agencies in Montana have initiated cooperative approaches to address these problems.

2. Policy guidance of the Federal Land Management Policy Act is for nonproliferation of separate rights-of-way and endorsement of corridors where rights-of-way exist at present. Such a policy fails to recognize that no analysis has been done to establish that existing rights-of-way are the best locations for additional linear facilities. Furthermore, local and regional pressure is frequently toward placing new linear facilities in uncongested areas because existing rights-of-way are located in areas where competition among land uses and human settlement patterns is greatest.

3. State policy expressed in the MFSA and in positions taken by Montana's Congressional delegation places emphasis on public lands as the preferred location for facilities if economic considerations are equivalent to those on private land and if environmental compatibility criteria are met. This fails to recognize possible land use and management implications or the obligation of both federal and state agencies to balance many complex resource values in making right-of-way siting decisions.

CHAPTER 3—POLICIES AND OTHER CONSIDERATIONS OF RIGHT-OF-WAY USERS

Right-of-way users acquire linear rights-of-way for the purpose of developing needed facilities to provide public services or in the case of some oil and gas facilities, to competitively transport products to market. Users apply to state and federal agencies for approval of a specific project and a right-of-way grant. Users which provide public goods and services often are granted the power of eminent domain to secure rights-of-way across private lands.

The users discussed in this chapter include private and publicly-owned utilities, pipeline companies, federal power marketing agencies such as Bonneville Power Administration and Western Area Power Administration, and state and federal highway authorities. The latter two categories of users are governmental agencies that provide services.

The following sections outline considerations that often weigh in users' decisions to site linear facilities.

Electric Industry

The electric industry, including utilties and the federal power marketing agencies, has a number of general policy considerations which influence routing decisions concerning joint use of rights-of-way.

Private electric utilities generally serve market areas within individual states. Occasionally these markets cross state lines. While power generation and transmission in their service areas is the primary function of these companies, they can also sell electricity out of immediate market areas and transmit the power through other utility companies or BPA and WAPA.

Rural electric distribution cooperatives (RECs) provide another level of service. The Rural Electrification Administration (REA) is a funding agency for RECs and sets design standards for projects constructed by the individual RECs. Historically, small groups of people organized to form an electric cooperative to provide power to those areas where it was or is not profitable for private companies to build transmission lines or distribution systems. Rural Electric Cooperatives can purchase power directly from the federal power marketing agencies, obtain electricity from surrounding investor-owned utilities, or, in concert, form an electric generation and transmission cooperative to provide power and bulk transmission service. While individual RECs can own and operate electric generation and transmission systems, costs and reliability are often prohibitive. Thus, many RECs rely on private utilities or the federal marketing agencies to design, build, and operate transmission lines or the RECs organize into larger generation and transmission cooperatives. A number of factors influence the location of a proposed electric transmission line. For example, a final decision usually reflects a balance between construction cost and environmental disturbance. At the same time, decisions do not compromise safety, reliability, sound construction standards, and the capability to transmit the required amount of energy. Thus, selection of rights-of-way must limit undesirable environmental impacts while enabling a company to provide reliable electrical service to its customers and retain a reasonable return for its investment. Studying all possible routes that meet relevant environmental and engineering constraints helps to identify areas for potential use as rights-of-way. Most private companies are involved in joint regional power planning and are committed to meeting both the needs of their customers and the needs of the region. This includes developing and sharing sources of generated electricity.

Providing timely information to the public concerning route selection, environmental factors, and construction impacts of a transmission line is considered important by the Pacific Power and Light Company (PP&L). This statement of policy, which Montana Power Company also intends to adopt, details both procedural and substantive factors for rights-of-way planning. For example, full and accurate dissemination of information to government agencies, affected landowners, and public or consumer groups is usually carried out to accomplish an objective, such as explaining the need for the line, and continues through route selection and right-of-way and permit acquisitions (PP&L 1977).

Designing a transmission line requires structures and materials that meet industry standards for safety and reliability. Thus, the capability to transmit a required amount of power and to maintain the required reliability are paramount in line design.

The Bonneville Power Administration has developed right-of-way practices with the intent of protecting the public and maintaining a reliable power system while lessening the impact of new electric transmission lines on other facilities. The Bonneville Power Administration has a policy to upgrade or use existing transmission line rights-of-way to the extent possible. However, the factors of safety, reliability, and ability to provide the required service are essential considerations to both BPA and WAPA. Decisions for joint use of an existing transmission line right-of-way are made in light of technical compatibility and costs incurred for achieving compatibility. The complexity of these issues requires case-by-case evaluation.

Pipeline Industry

Pipeline transmission systems transport oil and gas to market, move crude supplies to refineries, and carry refined products from those refineries. The oil and gas industry is not able to accurately predict future pipeline right-of-way needs until a field is discovered and the capacity of the existing pipeline system to absorb the new supply is analyzed. Gathering systems move crude oil or natural gas from the fields to collection points or they tie into other collection systems. Locating and constructing a pipeline depends on where the resource

is found, the availability and capacity of nearby transportation systems (gathering, collecting, and transmission), and market areas.

Individual company policies on locating pipelines are informal and depend on a number of considerations, including cost, terrain, power availability and other routing constraints. Safety and construction requirements in state and federal laws also play a large part in siting decisions. Many of these considerations relate to technical and engineering compatibility of pipelines with other facilities or terrain limitations. These factors are discussed in Chapter 4.

State and Federal Highways

The Federal Highway Administration (FHWA) and individual highway departments in the states are responsible for providing highway transportation systems. Within Montana, the Department of Highways (DOH) plans, constructs, operates, and maintains the interstate and primary highway systems. The Department of Highways also constructs and operates secondary systems but maintenance is usually turned over to the counties involved. The FHWA oversees construction of federal highway systems through strict policies, standards, and guidelines that direct DOH and highway construction contractors. The Department of Highways acquires land for highway rights-of-way according to design requirements. Since these requirements can vary greatly, especially in hilly or mountainous terrain, no uniform right-of-way width has been set for Montana's highways.

Highway rights-of-way are unlike most other linear rights-of-way because they are purchased on private lands. Any utility or industry seeking to occupy or cross a highway right-of-way must obtain an easement from the state or county agency with authority over the roadway. The Department of Highways allows crossings and joint occupancy of its rights-of-way if the proposal increases public use of the right-of-way. However, decisions to allow joint occupancy must consider protection of public safety and avoid conflicts between utility and transportation systems. In the case of the formally declared interstate system, national security is an important factor in joint use decisions since these highways are part of the National Defense System. Other factors considered include standards for proper drainage, traffic protection, scenic enhancement, and others pertaining to highway maintenance or operation (ARM 18.7.201 et. seq.).

Railroad Industry

Present policies of the Burlington Northern Railroad Company (BN) limit use of railroad rights-of-way (BN 1981). Parallel encroachments are discouraged, and crossings by other facilities are strictly controlled. BN policies for occupancy and crossing railroad rights-of-way are concerned with compatibility considerations. It should be noted that parts of the state's rail system belong to the Strategic Rail-Corridor Network (DOH 1980). Compatibility factors between railroads and other facilities and terrain constraints for building railroads are presented in Chapter 4.

Communications Industry

Placement of communications facilities depends on a number of factors. Telephone land line systems are located to ensure system reliability and are placed within or in close proximity to existing highways or other roadways to allow easy access for maintenance (MB 1981). Other communication facilities, such as microwave systems, are used in conjunction with linear facilities, but they occupy point sites and airspace.

Information submitted by communications companies indicates that factors considered in locating communication facilities include characteristics and location of existing systems, power availability, altitude, technical compatibility with other linear facilities, and requirements of permitting agencies. While formal policies on locating communication facilities have not been developed by companies and government agencies, technical compatibility appears to be the paramount consideration.

Conclusions

A decision to site a new linear facility takes into account such factors as cost, terrain, safety, reliability and compatibility with existing facilities. Most policies depend on location and design factors often dictated by industry standards and government regulations.

Policies of right-of-way users in Montana also illustrate that there is concern about placing facilities in parallel or joint use situations. User policies, whether formally written or informally stated, are designed to protect the integrity of their systems; most policies allow occupancy or crossing of rights-of-way on a case-by-case basis only. If crossing or paralleling an existing right-of-way is allowed, it probably would be necessary for the parties to reach an agreement, although federal statutes require paralleling and joint use of rights-of-way on federal lands wherever possible.

The most important factors surrounding decisions to place facilities in close proximity are concerned with technical and engineering compatibility.

CHAPTER 4—TECHNICAL/ENGINEERING COMPATIBILITY CONSIDERATIONS

Two basic types of technical/engineering compatibility constraints on facility route selection are discussed in this chapter. Locational constraints are those imposed on a facility by the physical environment, such as rough terrain or wetlands. This discussion is limited to those environmental characteristics which present absolute physical barriers to facility placement or which can only be overcome through special design or construction techniques. Such constraints usually require project sponsors to decide either to: (1) incur the extra costs associated with special engineering requirements in order to locate a facility through a physically constrained area; or (2) route the facility over a longer distance that presents more favorable characteristics for construction and maintenance.

The other type of constraint is the adverse effects one facility may have upon another facility. Here, again, the trade-off may be one of incurring extra costs to mitigate the adverse effects through design adjustments or locating a new facility sufficiently distant from existing facilities to avoid the effects altogether. For both types of constraints, design solutions are not always possible, leaving route adjustments as the only solution.

Both types of constraints may be present, thereby compounding the problems of facility placement and design. Rough, topographically constrained areas with existing facilities already located in the most feasible places are an example.

National security consideration may also affect corridor decisions by precluding the location of some facilities in close proximity to others. However, the military value of linear facilities appears to be low compared to that of generation stations, refineries, consumption centers, and the like. In addition, electromagnetic pulse, created by nuclear blasts, affects electric transmission systems over large areas. It appears that transmission lines would be destroyed whether they are closely spaced or located separately. Placing linear facilities in common corridors increases the risk from natural disasters. For instance, earthquake-induced landslides have disrupted electrical transmission systems, railroads, and related facilities in the past and will, undoubtedly, damage them in the future. Corridor selection should consider geologic and meteorologic hazards to reduce these disruptions as much as possible. A policy producing realistic guidance on security considerations of military and natural disasters for utility, transportation, and communication facility placement is also needed.

The following discussion points out major technical/engineering compatibility problems in general terms for each type of linear facility and outlines some standard procedures for mitigating the problems. Specific and more technical details are presented in studies done by BLM (USDI 1975), the Aerospace Corporation (Aero 1975) and the Mitre Corporation (Mitre 1975). Additional detailed references for each type of facility are included in the following discussion. Each facility type will be discussed in terms of the following types of concerns, where applicable: (1) safety of the facility; (2) safety of nearby persons or other facilities; (3) reliability of operation; (4) construction considerations; and 5) maintenance considerations.

Electric Transmission Lines

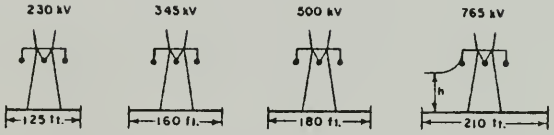
The principal technical constraints on siting electric transmission lines are: (1) the need for solid foundations for structures; (2) the safety of the lines and reliability considerations; and (3) the need to avoid interfering with other facilities. Examples of safety considerations are to avoid areas of subsidence, flooding, and other hazards. Important factors which determine location include points of origin and destination, and intermediate points of service or switching. Lines are constructed and maintained according to the National Electric Safety Code, and the industrial standards of the National Electric Manufactures Association and the Institute of Electrical and Electronics Engineers. The material published by these groups provides information on the design and safety of electric transmission systems. Figure 5 shows typical installation and right-of-way width requirements for electric transmission lines.

In the past, most transmission lines were built along highways or railroads primarily for ease of access during construction and maintenance. Today this is often too expensive because railroads and highways are built on low grades which usually wind back and forth, while transmission lines are capable of taking straighter and, therefore, shorter and less expensive paths, even through mountainous terrain and across gorges and rivers. Although both construction costs and environmental costs are usually increased and reliability is usually decreased when transmission lines are routed through rugged or inaccessible country, the cost savings associated with shorter routes may make such locations preferable or necessary due to the route requirements imposed by origin or destination. Colocation of facilities in mountain passes, river canyons, and congested urban areas often occurs for these reasons. Increases in cost also occur when lines must be routed around sensitive areas for environmental or social reasons. For example, concerns exist about the effects of electromagnetic fields on human health. These effects are highly controversial and are not well understood or observable, at least in the short term. Citizen concern about these factors can influence routing and line design decisions.

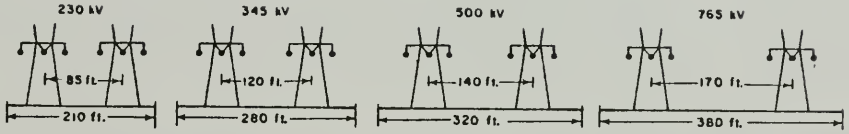
Electric transmission lines can have adverse effects on most other facilities such as pipelines and communications systems. The effects of powerline switching surges, fault currents, and electromagnetic and electrostatic fields on other facilities require mitigative measures such as shielding which can be quite costly, depending on the severity and amount of influence that

FIGURE 5

Typical Installations for Electrical Transmission Lines



TRANSMISSION LINE VERTICAL CLEARANCE	APPROX h ft.			
	230	345	500	750 kV
OVER PEDESTRIANS	26	31	38	49
OVER ROADS (vehicles)	30	34	41	52
OVER RAILROADS	40	45	50	62



TYPICAL DESIGN CONSIDERATIONS

- PREFER LINE-OF-SIGHT ROUTE
- STRADDLE EARTHQUAKE FAULTS (when possible)
- LIGHTNING GRND WIRE ABOVE CONDUCTORS
- LIGHTNING COUNTERPOISE UNDER TOWERS (lower cond soil)
- MEET WEATHER EXTREMES
- VEHICLE ACCESS (when possible)-PATROL AND MAINTENANCE
- MEET APPLICABLE FEDERAL/STATE REGULATIONS
- MEET NESC CLEARANCES
- DESIGN FOR ALLOWABLE INDUCED VOLTAGE, RI, TVI, AND AUDIBLE NOISE AT R/W EDGE

NOTE: ABOVE WIDTHS AND SEPARATIONS ARE FOR TYPICAL SINGLE CIRCUIT DESIGNS. HOWEVER, DOUBLE CIRCUIT REQUIREMENTS ARE APPROXIMATELY THE SAME.

SOURCE: The Aerospace Corporation, 1975

is exerted over nearby facilities. Compatibility among electric transmission lines and pipelines is the subject of much research. For example, groups like the Electric Power Research Institute (EPRI) and American Gas Association (AGA) have published a report entitled "Mutual Design Considerations for Overhead A. C. Electric Transmission Lines and Gas Transmission Pipelines" (1978). Interaction effects and mitigation techniques are discussed further in the following sections and summarized in Tables 4 and 6.

A number of groups have established reliability and other design and construction standards or guidelines for electric transmission lines. The National Electric Reliability Council (NERC), through its regional councils, establishes reliability criteria for designing and operating interconnected electrical supply systems. Montana is included in the Western Systems Coordinating Council's region. Utility members of the council voluntarily agree to plan and operate their systems according to specific reliability standards. The North American Power Systems Interconnection Committee (NAPSIC), the operations arm of the NERC, provides coordination of operating procedures among members and promotes reliability of operation among interconnected systems. NAPSIC has established minimum operating reliability criteria for use in interconnected systems.

Reliability in a power supply system is the ability of the system operated by one utility, as well as the interconnected systems of a region, to continue operation while some lines or generators are out of service. Major elements for reliability of service include criteria for: (1) transmission line planning; (2) electrical service planning; (3) operations; and (4) maintenance. Reliability criteria for transmission line and system planning provide minimum standards for system performance. Usually a system operates at a high level of reliability that would only be needed in the event of great stress on the system during a period of heavy load. In the Northwest, the peak load period is the winter season, although there is a lesser peak load during the summer for irrigation and cooling. During other times of the year, the load is reduced, but this reduction may be offset by the need to: (1) remove selected lines for maintenance and reconstruction; and (2) transmit surplus capacity from hydroelectric generation sources. An example of a reliability criterion is as follows: reduce regional disruption or load area separation by providing that major lines serving a major load area are strong enough to carry the load with one line out of service and still withstand the momentary interruption of energy flow (fault) on another line, followed by automatic restoration of energy flow to that line (USDI 1977).

Reliability criteria also establish principals and policies for providing required electrical service. For example, "it is a regionally recognized utility practice and design procedure. . .to provide a minimum transmission voltage level of 90% of the nominal voltage at the distribution substation during peak service load while one transmission line which normally serves that substation is out of service" (MPC 1974).

Reliability of operations criteria control the day to day operations of a system and help to define conditions for removing transmission lines for maintenance or reconstruction without jeopardizing electric service. Maintenance of equipment is a periodic requirement but it must be done without significantly impairing reliability. The ability to meet these criteria is a primary factor in right-of-way selection.

Pipelines

Standards, practices, guidelines, and compatibility factors for pipeline location, construction, operation, and maintenance have been established by groups such as the American Petroleum Institute (API), the American Gas Association (AGA), the American Society of Mechanical Engineers (ASME), the American National Standards Institute (ANSI), and the National Association of Corrosion Engineers (NACE). In addition, the Office of Pipeline Safety within the U.S. Department of Transportation has issued regulations which control both construction and operation of pipelines. Gas pipelines which are subject to the Natural Gas Pipeline Safety Act of 1968 (40 U.S.C. 1671 et seq.) also are required to meet the regulations contained in 49 CFR, parts 191 and 192. Pipelines carrying hazardous materials such as crude oil, petroleum products, liquified petroleum gases, and anhydrous ammonia are subject to the Hazardous Liquids Pipeline Safety Act of 1979 and must comply with regulations contained in 49 CFR, part 195. In addition, state and local codes and regulations often govern where pipelines can be located.

The regulations and standards address such matters as allowable pressures, temperatures, and other forces applicable to design of a specific pipeline, such as internal and external stress to the pipeline. Safety of pipelines is achieved, for example, through burying the pipe and incorporating cathodic protection devices to protect the pipe from corrosion. Pipelines are often sheathed with an external protective coating to prevent corrosion. Regular inspections of the pipeline also are made.

Pipelines are routed to avoid areas of difficult construction and hazards, such as landslides, active faults, flood plains, and rocky areas that require blasting to open the pipe trench. Pipes can be placed across wetlands, but must be weighted to prevent flotation. This is especially true with gas pipelines. Such actions are expensive, as are trenching and backfill operations. Therefore, wetlands are avoided whenever possible. Pipes are generally buried to provide protection from outside activities, such as machinery operating on the surface. Table 5 summarizes the normal depth for burying pipelines. Pipelines are buried at least an additional 12 inches in industrial and urban areas, or where the likeli-

TABLE 4

Interaction of Electrical Transmission Line with Other Facilities in Shared Right-Of-Way

	OTHER ELECTRICAL TRANSMISSION LINES	COMMUNICATIONS	PIPELINES	RAILROADS	HIGHWAYS
Effects of electrical transmission line on other utility line	Problems Reliability degraded. Safety during maintenance from voltage gradient. Mitigation Increase separation. Shielding.	Problems Steady state noise. Fault and lightning damage. Shock hazard. Corrosion of cable sheath. Construction damage. Communications interference. Mitigation Increase separation. Shielding. Lightning arrestor or spark-gap protection for faults and lightning. Filter electric lines to reduce harmonics. Increase conductor size, bundling, insulation.	Problems Corrosion. Shock hazard. Fire/explosion hazard. Pipeline rupture. Damage to pipeline during construction and maintenance. Mitigation Increase separation. Shielding. Cathodic protection. Low conductivity coating on pipe. Ground pipe while welding, at substations, and at test points. Avoid construction over pipeline location.	Problems Shock hazard. False control signals. Communications interference. Mitigation Increase separation. Shielding. Filtering electric lines to reduce harmonics. Use pulse-code communications. Avoid open-wire or ground-return communication circuitry.	Problems Radio noise. Audible noise. Esthetic impact. Interruption of vehicular flow during construction and maintenance Mitigation Increase separation. Shielding. Screen to reduce visual effect.
Effects of other utility line on electrical transmission	(See Above)	Problems Construction damage. Mitigation Increase separation	Problems Fire/explosion hazard. Construction or maintenance damage. Mitigation Increase separation.	Problems Derailment caused outage; reliability degraded. Fault currents transmitted by rails may be hazard to transmission line maintenance personnel. Mitigation Over-voltage protection for tracks to prevent fault transmittal problems and spark-gap protection for transmission lines.	Problems Transmission reliability degraded due to accident-related outages. Traffic endangers transmission line maintenance personnel. Mitigation Increase separation.

Source: The Aerospace Corporation, 1975.

TABLE 5

TYPICAL DEPTH OF COVER FOR UNDERGROUND PIPELINES

LOCATION	COVER (INCHES) Normal Excavation	Rock Excavation
Industrial, Commerical and Residential Areas	36	30
Crossing of inland bodies of water with a width of at least 100 feet from high water mark to high water mark	48	18
Drainage ditches at public roads and railroads	36	36
Deepwater port safety zone	48	24
Other offshore areas under water less than 12 feet deep as measured from the mean low tide	36	18
Any other area	30	18

Source: U.S. Department of Transportation, 1980.

TABLE 6 LAND APPORTIONED TO CONSTRUCTION OPERATIONS FOR VARIOUS RIGHT-OF-WAY WIDTHS[1]

	CUT OR FILL SLOPE (not included in total)	PASSING LANE BUFFER	PASSING LANE	BETWEEN LANE BUFFER	CONSTRUCTION TRAFFIC LANE	PIPE BUFFER	PIPE STAGING	TRENCH	TRENCH SPOILS CLEARANCE	SUBSOIL SPOILS	CLEARANCE BETWEEN SPOILS PILES	TOPSOIL SPOILS	GRADE DEBRIS	CUT OR FILL SLOPE (not included in total)	TOTAL (for graded R/W only)
Absolute minimum for conventional construction with passing lane, topsoil segregation	0	0	12 ft	2 ft	18 ft	0	8 ft	7 ft	0	15 ft	0	9 ft	0	0	71 ft
27 m (90 ft) R/W, flat terrain (NTPC Proposed)	variable	3 ft	12 ft	2 ft	18 ft	6 ft	8 ft	7 ft	2 ft	20 ft	2 ft	10 ft	0	variable	90 ft
27 m (90 ft) R/W, flat terrain, agricultural land	0	0	20 ft	4 ft	20 ft	0	9 ft	7 ft	0	15 ft	0	9 ft	6 ft	0	90 ft
27 m (90 ft) R/W, 15% slope, cut and fill, agricultural land—spoils uphill	6 ft	0	18 ft	2 ft	20 ft	0	9 ft	7 ft	0	15 ft	0	10 ft	0	6 ft	81 ft
23 m (75 ft) R/W, flat terrain no topsoil segregation	0	0	16 ft	4 ft	20 ft	0	9 ft	7 ft	0	19 ft	0	0	0	0	75 ft
23 m (75 ft) 15% slope, cut and fill, no topsoil segregation, spoils uphill	4 ft	0	16 ft	0	16 ft	0	9 ft	7 ft	0	19 ft	0	0	0	4 ft	67 ft
20 m (65 ft)	0	0	0	0	20 ft	0	9 ft	7 ft	0	15 ft	0	9 ft	0	0	20 ft
16 m (54 ft) R/W, flat terrain, no topsoil segregation	0	0	0	0	20 ft	0	9 ft	7 ft	0	18 ft	0	0	0	0	54 ft

Conversion: 1 ft = .3048 m

[1] Clearance and buffer zones are not included in right-of-way.

Source: DNRC, 1980

hood of accidental damage by other trenching and building operations is high. Likewise, since a prohibition on building is not possible along an entire right-of-way, it is standard practice to bury pipelines deeper when they pass within 50 feet of a building.

Steep terrain is avoided because it increases construction, operation (pumping, maintenance and inspection) and safety costs. If possible, pipelines are routed to avoid high mountainous areas. Short, steep hills and even short vertical pitches can be traversed, but long, steep slopes require special construction techniques (such as winching equipment) and higher pumping pressures.

Because heavy equipment is needed for complex trenching operations, pipelines are difficult to install near or under facilities already in place. In most cases, the width of a pipeline construction right-of-way is almost double the width of the permanent right-of-way. Extra space is needed to store ditch spoils and to allow passing of construction equipment. Table 6 provides information on rights-of-way width and Figure 6 illustrates normal pipeline construction operations. If called for by exceptional circumstances, special construction techniques, which are generally quite costly, may be used to greatly reduce the widths of both construction and permanent rights-of-way. For example, pipelines can be constructed from railroad cars using special cranes and excavation equipment. Also, pipelines can be placed into drilled or bored tunnels to avoid crossing problem areas.

Intermediate points of service and essential interconnection points, such as ties into other pipelines or pipeline systems, often determine pipeline routes. While there is often some choice in locating intermediate pump stations, the most efficient placement is the hydraulic center. This point for any specific pipeline is not determined randomly, and once it is determined, the intermediate pump station must be placed nearby.

Corrosion of pipelines that are placed in certain soils, such as saline soils, has historically been a serious problem; many old pipes have been or are being damaged. Modern cathodic protection devices, if properly designed for local soil conditions and properly maintained, provide nearly complete corrosion control. Pipelines near high-voltage, direct current (d.c.) electric transmission lines may also be highly susceptible to corrosion by ground currents. Mitigation of this problem is being studied. The problem is complicated by the difficulty in predicting the paths of electric current through the ground and pipeline. For example, current may diverge for miles before returning to a d.c. line. Studies to determine the effectiveness and cost of new mitigation measures to protect pipelines from d.c. electrical effects are now taking place. Table 7 summarizes the interactions of pipelines and other linear facilities, and the ways such effects can be mitigated.

Highways

Highway rights-of-way and road-width requirements vary considerably, depending on the class of highway involved. Interstate highways have the highest and most inflexible standards, requiring a minimum of four lanes, each 12 feet wide, shoulders not less than 10 feet in width, and a desirable right-of-way width of at least 90 to 110 feet. Primary and secondary roads require two lanes, each 12 feet wide, shoulders 10 feet wide, and a total desirable right-of-way width of 50 to 60 feet. If the right-of-way for an interstate highway must be limited, the border area is reduced first, then the median, rather than the traffic lanes or shoulders. Right-of-way widths for highways through mountainous terrain may not be uniform due to the cut-and-fill techniques sometimes required in road construction.

Design standards for federal aid highway projects are listed in the Federal Highway Administration's (FHWA) Federal Highway Program Manual (1975). In addition, the American Association of State Highways and Transportation Officials (AASHTO) has established design guidelines in a document entitled, *A Policy on Geometric Design of Rural Highways* (1965).

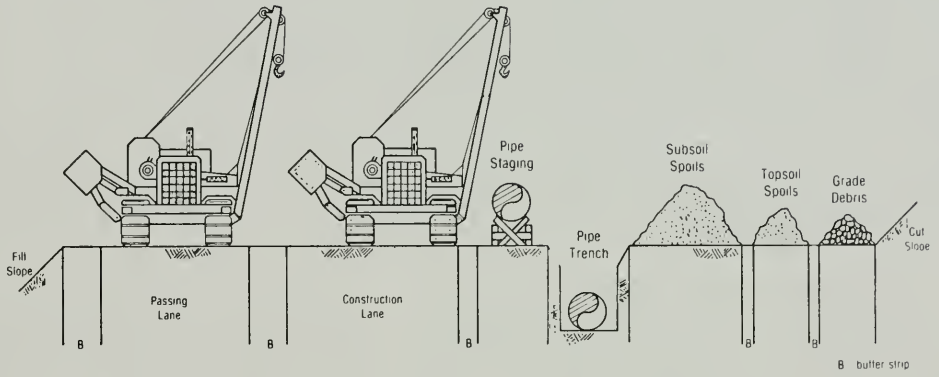
Occupancy of federal-aid highway rights-of-way is allowed if there is no interference with the free and safe flow of traffic or impairment of the highway or its visual quality (23 CFR part 654B). This policy contains additional details on measures considered necessary to preserve the integrity of the highway. Federal regulations on highways incorporate AASHTO policy on *Application of Joint Development and Multiple Use Concepts to Freeways and Utilities* (1979). This "establishes a basis for accommodating the highest type of utility facilities along and within the rights-of-way of highway facilities under conditions where the construction, maintenance, and operation of one do not adversely affect those of the other. . .The utility strip may be established only where the freeway rights-of-way are of ample width to accommodate utility facilities without adverse effect to the design, construction, integrity, and operational characteristics of the freeway . . .In each case, there must be a showing that installation on the freeway is the most feasible and prudent location available from the standpoint of the highway user and the utility consumer" (23 CFR part 645B, Appendix A).

Highway locations are restricted by grade and must meet certain vertical and horizontal curvature criteria. Highways are constructed in valley bottoms and low foothill areas wherever practical. The circuitous routes which highways usually follow in rough terrain make them impractical locations for new electric transmission lines or pipelines. Table 8 presents allowable grades for highways as well as other facilities.

Reliability for highway systems is obtained through design, construction, operation, and maintenance

FIGURE 6

Typical Features of a Construction Operation for a Large-Diameter Underground Pipeline



Source: Gulf Interstate 1979

TABLE 7

Interaction of Pipeline with Other Facilities in Shared Right-Of-Way

	ELECTRICAL TRANSMISSION	COMMUNICATIONS	OTHER PIPELINES	RAILROADS	HIGHWAYS
Effects of pipeline on other utility lines	Problems Fire/explosion hazard. Construction or maintenance damage. Mitigation Increase separation.	Problems Cathodic protection interaction. Fuel leak damage/ personnel safety. Construction damage. Mitigation Increase separation. Cathodic shielding.	Problems Cathodic protection interaction. Fuel leak/fire and explosion hazard. Mitigation Increase separation. Cathodic shielding.	Problems Construction damage. Fire/explosion hazard. Mitigation Increase separation.	Problems Interruption of vehicular flow during construction and maintenance. Fire/ explosion safety hazard. Mitigation Increase separation.
Effects of other utility line on pipeline	Problems Corrosion. Shock hazard. Fire/ explosion hazard. Construction or maintenance damage. Pipeline rupture. Mitigation Increase separation. Shielding. Cathodic protection. Low conductivity coating on pipe. Ground pipe while welding, at substations, and at test points. Avoid construction over pipeline location.	Problems Construction damage. Pipeline ruptures. Mitigation Increase separation Avoid construction over pipelines.	(See Above)	Problems Derailment damage to valves, compressor or pumping stations, etc. Pipeline rupture. Mitigation Increase separation. Avoid construction over pipeline location.	Problems Access interference. Fire/explosion safety hazard. Vehicle damage to above-ground facilities due to accident. Pipeline ruptures. Traffic endangers pipeline maintenance personnel. Mitigation Increase separation. Avoid construction over pipeline.

Source: The Aerospace Corporation, 1975.

TABLE 8

Maximum Allowable Grade for Different Facility Types

SYSTEM	MAXIMUM ALLOWABLE GRADE
Electric Transmission line [1]	100%
Communication line	May not be applicable because of probable location next to highway or railroad
Pipeline - oil and gas	--- [2]
Pipeline - coal slurry	--- [2]
Highway - design speed, 70 m.p.h.	6% maximum
Highway - design speed, 60 m.p.h.	
Highway - design speed, 50 m.p.h.	3-4% preferred
Railroad	1% desired 2.2% rare

[1] It is seldom that a tower is located on a 100 percent (45) slope. Steep slopes do pose a problem for access roads for construction or maintenance of lines or substations because of the heavy equipment that is needed. However, other means of construction can be used. Conductors have no grade restrictions.

[2] There are no standard maximum grades for pipelines. Technically, it is possible to pump vertically, however, this is limited by maximum allowable pressure within the pipe as established in DOT regulations.

Source: The Aerospace Corporation, 1975.

standards. Design factors include grade, clearance, curves, shoulders, and aesthetic considerations.

Railroads

Railroad engineering standards and practices have been developed by individual railroad companies, the Association of American Railroads, and the American Railroad Engineering Association (AREA). These standards relate to gauge of track, terrain constraints, and joint use considerations, and have been published in the *Manual of Recommended Practices* (1969) by AREA. Department of Transportation (DOT) regulations also provide standards or controls on track usage and signal systems.

Railroads are extremely grade-sensitive and, like highways, require much excavation through mountainous and hilly terrain. Allowable grades of 2.2% have been used in mountainous terrain but use of such grades is rare. In addition, sites with stable soils are preferred. The grade restrictions and winding paths make the paralleling of railroad rights-of-way in rugged terrain generally undesirable for other linear facilities, except for short distances through passes. Railroad rights-of-way may be shared by other facilities in urban areas or narrow valleys, although individual railroad policies may discourage such use. Right-of-way widths are typically about 100 feet on level terrain.

In Montana, the Burlington Northern Railroad does not allow parallel encroachments on right-of-way or track crossings of less than a 45-degree angle. Burlington Northern has established various technical specifications to be used by other facilities for overhead and underground crossings of the track. For example, overhead electric transmission lines crossing the track must clear the track by 36 feet; this requirement increases by 1/2 inch for each kV over 194 kV. Pipelines must be placed under tracks by boring and jacking whenever practical (BN 1981).

Railroad communication and signaling systems direct and control the movement of engines and cars on the mainline system and at crossings, junctions, and terminals. Radio and carrier communication provide additional safety features for train movements, but do not replace the signaling system. Signaling systems can be protected from lightning by surge protectors, but these are usually not adequate protection against induction from electric transmission lines.

Short segments of abandoned railroad right-of-way may be suitable for primary or secondary highways, local roads and facilities such as pipelines. Segment lengths would typically be 2 to 20 miles long, primarily in the western part of the state. The Department of Highways, in conjunction with FRA, issues annually the *State of Montana Rail Plan*, which lists existing and abandoned rail systems, traffic density and other factors, such as national defense, that may be important considerations in corridor planning along railroad rights-of-way.

Communication Systems

Communication systems include microwave, radio, telephone and related facilities. Standards, guidelines, and practices have been established jointly by industry and the Edison Electric Institute. The Federal Communications Commission (FCC) is the primary agency which regulates or establishes criteria and codes for system reliability. In addition, industry standards and regulatory agency requirements influence the design of communication systems.

Construction of communication systems can involve grading and clearing the land and erecting poles, or trenching and burying the line and restoring the ground surface. Choice of construction methods depends on the characteristics of the route, line safety and reliability, and costs. Both methods can meet siting criteria but underground cables are more sensitive to soil conditions and problems in crossing faults, canyons, and rivers. A principal factor for locating communication facilities is ease of access for construction and maintenance. This is especially true for buried telephone cable. Generally this means placing the cable close to a state or local highway. Many communication systems, like microwave systems, do not occupy linear rights-of-way, although terrain is an important factor in locating tower sites.

Communication systems suffer decreases in reliability from a number of causes. Electric interference from powerlines and lightning must be reduced through grounding and shielding. Also, communication systems, especially those buried in highway rights-of-way, often are disturbed when rebuilding or upgrading of the highway occurs.

Conclusions

Technical/engineering compatibility factors place limitations on where linear facilities can be economically placed, either due to the physical characteristics of a location or adverse effects on or from other facilities.

Economics is often a more central factor than technical feasibility in determining whether rough or otherwise inhospitable terrain will be crossed, or whether design features will be incorporated to allow otherwise incompatible facilities to be sited in relatively close proximity.

Engineering and construction techniques can achieve compatibility with most terrain and environmental factors if cost is not a limitation. Safety and terrain considerations have given rise to numerous industry and regulatory standards, guidelines and construction specifications. For example, terrain greatly limits the placement of highways and railroads because of maximum allowable grades. Electric transmission lines are

affected least by terrain factors since steep areas and water bodies can be spanned if necessary. Both electric transmission lines and pipelines follow as straight a route as possible to reduce the length and, thus, the cost of the line. Because cost is such a central concern, utilities must decide whether to cross difficult terrain with the shortest possible route or add to length in favor of less expensive construction. These decisions obviously require a case-by-case analysis.

Technical/engineering compatibility between facilities is complex. A case-by-case evaluation is usually essential to determine compatibility between a new facility and an existing facility. Table 9 summarizes the system interactions of facilities discussed in this Section. Table 10, as well as Tables 4 and 7, present common mitigation steps which can be taken to achieve compatibility.

The most common step is to separate facilities to avoid system interaction, although in topographically constrained areas separation may not be physically possible. Separating facilities also may be more expensive than modifying designs so the facilities may be placed in close proximity. In adjusting the location of a right-of-way to address compatibility considerations, the most obvious concerns would be the increased cost of constructing a facility over a longer distance and the cost of maintenance.

The extent to which facilities can be located in corridor areas through regulatory decisions in order to lessen impacts to the natural environment without imposing huge financial burdens on project sponsors is a related concern. When facilities are located closer together, compatibility problems increase while the area of land affected and associated impacts may decrease. When facilities are spaced farther apart, compatibility problems tend to decrease although the area of land affected, associated land use conflicts, and environmental impacts may increase.

Industry is probably in a better position than government to determine and balance compatibility costs; however, regulatory agencies must take factors other than engineering constraints and cost into consideration in making siting decisions. If facilities are placed in a corridor, questions of whether the owners of all facilities involved or only the owners of new facilities should pay the costs of mitigating compatibility problems will have to be answered. There does not appear to be an easy way to establish a corridor area without accepting some tradeoffs among cost, natural resources, and social concerns.

The complexity and number of compatibility factors makes the feasibility of designating corridors uncertain. Specific technical and engineering compatibility factors such as cost, safety, and reliability may render a corridor unsuitable for a given facility, especially if other facilities are already present. It is unlikely that agencies responsible for corridor planning and management will be able to answer all the technical questions that future use of a corridor by a new facility may pose. The number and type of facilities that can be placed through any potential corridor, especially those in topographically constrained areas, may be impossible to predetermine. This is especially true if new techniques are developed to mitigate compatibility problems at reasonable cost or to determine actual cost of compatibility between facilities. A case-by-case analysis of compatibility is necessary in deciding where any facility can or should be placed.

TABLE 9

Summary of System Interactions for All Facilities in Joint Use Rights-Of-Way

Influencing System \ Affected Systems	Electrical Transmission	Communications	Pipelines	Railroads	Highways
Electrical Transmission	Reliability degraded. Safety during maintenance from voltage gradient.	Steady state noise. Fault & lightning damage. Shock hazard. Corrosion of cable sheath. Construction damage.	Corrosion. Shock hazard. Fire/explosion hazard. Construction damage.	Shock hazard. False control signals. Fire hazard. Communications interference.	Radio noise. Audible noise. Fire hazard. Shock hazard.
Communications	Faults during construction.	Crosstalk. Cathodic protection interaction. Construction damage.	Cathodic protection interaction. Construction damage.	Construction damage.	Access interference.
Pipelines	Faults during construction. Fire/explosion hazard.	Cathodic protection interaction. Fuel leak damage/personnel safety. Construction damage.	Cathodic protection interaction. Fuel leak/fire and explosion hazard.	Construction damage. Fire/explosion hazard.	Access interference. Fire/explosion safety hazard.
Railroads	Derailment caused outage - reliability degraded.	Electrified RR's same problem as power. Derailment damage to repeater stations or above ground facilities.	Electrified RR's same problem as power. Derailment damage to valves, compressor or pumping stations, etc.	Reliability degraded due to possible accident. Safety degraded.	Safety degraded due to potential accidents. Access interference.
Highways	Reliability degraded due to accident related outages.	Damage to repeater station or above ground facilities due to vehicle accident.	Vehicle damage to above ground facilities due to accident.	Reliability degraded due to possible accident. Safety degraded	Safety degraded due to potential accidents. Access interference.

SOURCE: The Aerospace Corporation, 1975

TABLE 10

Summary of Common Mitigation Measures to Achieve Technical Compatibility in Joint Use Rights-Of-Way

Influencing System \ Affected Systems	ELECTRICAL TRANSMISSION	COMMUNICATIONS	PIPELINES	HIGHWAYS	RAILROADS
ELECTRICAL TRANSMISSION	Increase seperation. Shielding.	Increase seperation. Shielding. Lightning arrestor or spark-gap protection for faults and lightning. Filter electric lines to reduce harmonics. Increase conductor size, bundling, insulation.	Increase seperation. Shielding. Cathodic protection. Low conductivity coating on pipe. Ground pipe while welding, at substations, and at test points. Avoid construction over pipeline location. Anode bonding.	Increase seperation. Shielding. Screen to reduce visual effect.	Increase seperation. Shielding. Filtering electric lines to reduce harmonics. Use pulse-code communications. Avoid open-wire or ground-return communication circuitry.
COMMUNICATIONS	Increase seperation.	Increase seperation. Cathodic shielding.	Increase seperation. Avoid construction over pipelines.	Increase seperation.	Increase seperation.
PIPELINES	Increase seperation.	Increase seperation. Cathodic shielding.	Increase seperation. Cathodic shielding.	Increase seperation.	Increase seperation.
HIGHWAYS	Increase seperation.	Increase seperation.	Increase seperation. Avoid construction over pipeline location.	Increase seperation.	Increase seperation.
RAILROADS	Over-voltage protection for tracks to prevent fault transmittal problems and spark-gap protection for transmission lines.	Increase seperation. Cathodic shielding.	Increase seperation. Avoid construction over pipeline.	Increase seperation.	Increase seperation.

Source: The Aerospace Corporation, 1975.

The tasks of siting individual linear facilities and planning for corridors are complex because diverse concerns for resource and land use values that are not easily compared. At times, these concerns are in direct contradiction to, or in competition with, one another (e.g., deciding whether to route a high voltage transmission line through an exceptionally scenic, roadless area that is not protected by law or through a populated urban area). Siting decisions must also consider the views and values of persons living near a proposed route or corridor, the resource values and land management priorities expressed in federal and state laws, the views and preferences of project sponsors, and the intrinsic values and characteristics of the area(s) that would be crossed. If facilities or corridors are needed, they must be placed somewhere. Thus, the siting decision always affects some resources or persons adversely, or stated another way, some resources or persons escape impacts at the expense of other resources and persons.

Resource Trade-offs

While many impacts of linear facilities can be mitigated, there are always associated costs, including the costs of construction and operation, and the costs to public or private resources. For example, placing an electric transmission line in foothills rather than in an agricultural valley may require that areas be leveled for tower pads, trees cleared, and the route possibly lengthened. The cost of building the facility is, therefore, increased. A loss of timber productivity and impacts to scenic areas may also occur.

One approach to making trade-offs is to concentrate on the characteristics and uses of the areas being evaluated and to disregard ownership in determining the combination of wildlife habitat, prime agricultural land, prime forest land, pasture land, and scenic areas that will be crossed. The problem with this approach is that many times the least disruptive decision, taking all land uses and values into account, may not be the most publicly acceptable.

The difficulty of making trade-offs in siting linear facilities is compounded by the impacts these decisions have on persons who live near rights-of-way. The difficulties encountered in routing the Colstrip 500 kV transmission line provide a rather comprehensive example of the problem.

Issues raised by private landowners and public groups are usually a reaction to an individual project, but in a larger sense, these issues represent inherent conflicts for the corridor planning process. Some of the concerns of private landowners, public groups, and Indian Tribes are discussed below.

Private Landowners and Public Groups

Private landowners are concerned about changes in land use and land values, potential interference with existing land use, and other impacts that a new linear facility represents. Agricultural landowners are concerned with the effects the facility will have on the land's productivity and future uses such as expansion of irrigation systems. Landowners also are concerned about effects on property values. Any right-of-way evaluation approach which disregards ownership issues is clearly inadequate for decisionmaking; facility rights-of-way do affect private landowners and these impacts must be considered along with the trade-offs that are made among other resource and land use values. Inverse condemnation is a process whereby landowners may be compensated if their property is damaged or reduced in value due to the activities of an adjacent landowner. Where linear facilities or corridors are sited on federal land, the public may be the landowner responsible for damages on adjacent private lands. The potential for this situation to occur must be recognized and incorporated into right-of-way evaluation and corridor planning processes.

There is no clearly defined line between private landowners and public groups in identifying the issues and resource values that may be of concern. For example, recreationists and sportsmen are concerned with protecting recreation, wildlife, and scenic values. Sometimes these values are in conflict with private land uses such as agriculture. On the other hand, depending on the type of land use, private property values may be intrinsically tied to the scenic or natural environmental quality of an area.

Another type of route selection problem frequently of major concern to citizens is the possible health effects of linear facilities. Examples include the potential effects of electromagnetic fields associated with high voltage transmission lines and the potential hazards pipelines represent to nearby residents if a line ruptures. These concerns may present arguments against siting facilities near populated areas, but such concerns may be in direct conflict with the concerns of environmental and sportsmen's groups.

The Tribes

The seven Indian reservations in Montana are separate political entities. For right-of-way grant decisions, the federal Bureau of Indian Affairs (BIA) acts as a legal trustee for tribal lands and must by law grant access to cross Indian lands (25 USC chapter 1, part 161). However, BIA approval depends on concurrence of the affected Indian tribe. The individual tribes and tribal councils retain their sovereignty and authority to deny or approve a project.

Social, economic, and environmental considerations, tribal attitudes toward development, and the changes that a facility and associated right-of-way would mean to the Indian way of life are weighed in the decision.

Conclusions

Social issues are centrally important to the process of siting individual rights-of-way and have equally important implications for corridor planning. The concerns of the general public and landowners, and the Tribes when route proposals would affect Indian lands, must be integrated into the evaluation process.

The problem is not that agencies and decision makers are concerned with different issues than citizens and landowners. The problem, and the challenge, is one of using effective ways of communicating with landowners and other groups to: (1) identify their concerns; (2) explain how their concerns will be incorporated in the evaluation process; and (3) explain the complex and often conflicting resource and land use values and costs and benefits that must be weighed in reaching right-of-way or corridor decisions.

SECTION III—MDA CORRIDOR SELECTION PROCESS FOR MONTANA

Corridor selection and designation is a controversial subject that generates considerable concern about how, or if, such a process should occur. Federal law gives the Forest Service and Bureau of Land Management authority to designate areas of federal land as utility and transportation corridors, but does not dictate how this is to be accomplished. The State of Montana has no authority to designate corridors but has cooperated with the federal agencies to explore options for fulfilling their legal responsibilities. Corridor designation does not have to occur within a set framework that focuses on the entire length of an existing or potential right-of-way. It may be possible to preserve areas most critical or suitable for rights-of-way through other, more flexible means. Approaches to corridor design are discussed below. The need for corridors and additional linear facilities must be determined before any decisions are made to designate corridors or site individual rights-of-way. This topic is discussed further in a later section concerning implementation options.

APPROACHES FOR CORRIDOR SELECTION

Three approaches for designating corridors—the direct (where facilities can go), indirect (where facilities cannot go), and combination (mixture of direct and indirect) are discussed in this section. The direct and indirect approach both identify two categories of land: where facilities can go and where facilities cannot go. The combination approach involves three basic categories of land: where facilities can go, where facilities cannot go, and unclassified areas that would be studied on a case-by-case basis to determine possible routes for a specific facility. In the following discussion, each approach is evaluated according to the flexibility of the process.

Direct Designation (where to place facilities)

The direct approach identifies areas of land for designation as corridors. Each type of corridor—long linear corridors or windows—accomplishes a specific purpose and differs in the amount of land involved. Designation of long, narrow corridors is not generally desirable for a number of reasons. If the origin, the destination, or both for a specific linear facility do not fall within the corridor, a decision to site the facility in the corridor may greatly increase the length of the facility, increase the costs, and otherwise burden the project sponsor. On the other hand, if corridors are not used, designation makes little sense. A related problem is changes in sources and markets that dictate the need for new facilities. Corridor planning must be sensitive to future needs. Long linear corridors appear particularly inflexible in this sense. If one or more corridors are formally designated in a land management plan and rights-of-way in other locations are precluded, a lengthy amendment process could be required if right-of-way needs change. Long narrow corridors also virtually guarantee that decisions on federal lands will dictate uses and affect property values of adjacent state and private lands; "de facto" management of these lands could be the result. Furthermore, linear corridor designation shifts the planning responsibilities for facilities from industry to government agencies which do not, as a rule, have engineering expertise or familiarity with industry standards and design requirements. Another problem with long corridors is that they tend to give the impression that an entire route for one or more facilities has been approved in advance of any proposals or evaluation of the facilities. In summary, long corridors reduce planning flexibility.

Designating windows is preferable to designating long corridors for several reasons. A major advantage is that windows can protect critical right-of-way areas without the problems of long designated corridors. Windows can be used more flexibly in response to origin, destination, source, and market differences, and they are less of a burden on agency planning. Also, industry has voiced a concern that designation of corridors may add expense and length to their facilities. Window designation will give industry more freedom in selecting alternative routes than long designated corridors would permit. The impression of advanced approval of a project is less likely if windows are designated because a large portion of a proposed route would probably be outside the window area.

Designated window areas may involve some of the same problems as long corridors. For example, the need to recognize patterns of land ownership is not eliminated, especially if private or state land is adjacent to a window. Also, designation of windows does not prevent right-of-way proliferation. Although agencies must still evaluate cost, compatibility, engineering constraints, resource trade-offs, need, and other factors for individual projects, designated windows are preferable to long designated corridors because they leave much of the facility engineering and planning to the project sponsor.

Indirect Designation (where not to place facilities)

The indirect approach identifies areas where facilities cannot or should not be placed through use of exclusion and avoidance areas. This approach highlights specific resources and land use values. Constructing linear facilities would be prohibited in exclusion areas, while avoidance areas could be crossed under strict conditions, although, by definition, facilities should avoid these areas to the greatest extent possible. Table 11 summarizes categories of possible exclusion and avoidance areas for use in corridor planning in Montana. This list is not comprehensive. All areas not identi-

TABLE 11

Exclusion and Avoidance Area Categories Suggested for Use in Montana [1-2]

EXCLUSION AREAS	AVOIDANCE AREAS[3]
National Parks	Prime Forest Land
Designated Wilderness Areas	Prime Agricultural Land
Designated Primitive Areas	Sprinkler Irrigation Systems
Wilderness Study Areas	Recreation Areas
Recommended Wilderness Areas	Scenic Areas
Established Wild and Scenic Rivers	Back Country or Roadless Areas
	Major Population Centers
	Critical Wildlife Habitat
	Fish/Wildlife Management Areas
	Environmentally Sensitive Areas
	Conservation Easements
	Categories of County or City Zoning
	Topographically Constrained Areas

[1]This is only a preliminary list to show general categories of land for classification as exclusion or avoidance areas.

[2]These categories are not specific to all types of facilties.

[3]Avoidance areas could also be categorized, if desired, by levels of avoidance; for example, Prime Forest land may be high avoidance, Major Population Centers, low avoidance.

fied as exclusion or avoidance areas could potentially accommodate rights-of-way, and project sponsors would focus on these areas in identifying proposed routes for linear facilities.

The biggest advantage of indirect corridor designation is that it retains flexibility for both land management agencies and project sponsors. Indirect designation concentrates agency efforts on the protection of important natural, cultural, and social values and does not force them into the role of prematurely anticipating right-of-way needs or assuming industry's role in facility planning. However, total reliance on the indirect approach has some problems. The major disadvantage of this approach is that critical right-of-way areas may not be preserved. Ideally, an exclusion/avoidance classification system should take a broad range of natural resource as well as social concerns into account. If it fails to do this, a corridor evaluation system based on exclusion and avoidance areas may not provide a comprehensive framework for federal/state corridor planning. Also, the approach's high degree of flexibility may fail to provide enough direction for land management agencies and industry to meet their planning objectives.

Combination of Direct and Indirect Approaches

A combination approach would include identifying windows to protect critical right-of-way areas and identifying exclusion and avoidance areas to protect important natural, cultural, and social values.

Using windows and excluding and avoiding sensitive areas should help limit proliferation of rights-of-way and allow state and federal agencies some flexibility in their planning processes. Industry could continue to design its own routes to meet its source-to-market needs. Also, routing decisions would be speeded up because exclusion and avoidance areas would be identified prior to the route selection process. In addition, window designation better incorporates multiple use factors and is less presumptive concerning uses of adjoining nonfederal lands. Attention would therefore be focused only on those areas likely to contain acceptable locations for facilities. The cost and time required to evaluate facility proposals might, therefore, be reduced. Environmental impacts also might be minimized because sensitive areas would be eliminated from further study at an early stage.

The concept of a "window" is valid only where there are geographical constraints to siting facilities. These constraints can be caused by exclusion areas or avoidance areas, although not all avoidance areas are equally constraining. Steep slopes containing abundant wildlife and other resources could be an avoidance area based on environmental and engineering considerations. However, if that area is bounded by much higher and steeper slopes containing more critical resources, the area might potentially serve as a window. Avoidance areas can include bodies of water, urban areas, and so forth; thus, windows can exist through mountainous terrain or in valleys. The definition of avoidance areas may depend to some degree upon the kinds of facilities that are being evaluated. Therefore, windows for different kinds of linear facilities might not necessarily occupy the same locations. For example, a large area of center pivot irrigation could be an avoidance area for a transmission line but could be a window for a buried pipeline. A major advantage of the combination approach is that it can provide a balance between state and federal priorities and between agencies and project sponsors in their planning roles.

Analysis of Approaches

A disadvantage inherent in all three approaches is that a continuous, extensive system for land classification and management of all lands does not exist. Without such a system, these approaches could be difficult to use. A workable land classification system, however, would not solve all the problems; agencies would still have to analyze the impacts of specific facilities proposed in areas not identified either as a window or an exclusion or avoidance area.

Another problem is that establishing the criteria or categories through which land management agencies could identify exclusion and avoidance areas could be difficult and also expensive. However, the task might not be as difficult if the work of others who have already established such criteria is used. The key advantage of the combination approach is that it establishes both critical right-of-way areas and protects other valuable resource areas. In this sense the combination approach provides planning flexibility for agencies and industry and maintains flexibility for siting new facilities.

Although it may seem impossible to incorporate all important factors in a coordinated corridor planning process, the approach chosen for Montana must accommodate both federal and state priorities. While both the indirect and direct methods of corridor designation have attractive benefits, each also exhibits some major drawbacks. The combination approach seems to have more advantages than disadvantages.

IMPLEMENTATION OPTIONS FOR CORRIDOR DESIGNATION

A process is required to determine the need for corridors, accommodate local opinion, safeguard environmental values, expedite the siting process for individual facility proposals, and meet state and federal corridor goals and objectives.

Since the siting of individual rights-of-way and corridor

designation are separate decision actions, joint federal/state planning must be responsive to both short and long term needs. From a practical standpoint, before any individually proposed linear facility is sited, it should be evaluated under a joint federal/state process that also demonstrates the appropriateness of or need for the facility. Automatically deciding that all projected facilities are needed and that they all will require rights-of-way by a certain point in time could result in overemphasis on corridors at the expense of other land use considerations within the land management and planning process. It is inevitable that a certain number of corridors will be necessary and it would be inappropriate not to plan for them. The challenge for federal/state agencies is to identify a common and flexible process for the identification of needed corridors in a timely and environmentally sound manner.

If the combination approach is followed, the next step would be to define a process to evaluate (1) areas in Montana which have been preliminarily identified as existing problem areas because of land use or topographical constraints; and (2) other areas which may be alternative locations for corridors but which have not been examined in the corridor planning study.

Evaluation Factors

Process options can be evaluated in terms of time, cost, effectiveness, acceptability of results, defensibility of results, and public involvement opportunities. Time and cost are interrelated. Enough time must be allocated to make responsible corridor planning decisions; hasty decisions are often not the best. However, a lengthy process may be expensive and may not meet agency planning objectives. The questions of who pays for the evaluation work and how environmental trade-offs are made are major considerations in determining the cost of a process. Effectiveness of the process and acceptability of the results are also important factors. An effective process will result in protection of critical right-of-way areas. Central to acceptability of results is the process used to make trade-offs among environmental and social values and land uses in identifying corridor areas. These trade-offs must be defensible and understandable. Providing opportunities for public involvement in the resource trade-off and corridor decisionmaking processes is essential to measure the acceptability and defensibility of the results.

The New Mexico BLM Study

In its preliminary work to identify an acceptable process for identifying windows and exclusion and avoidance areas, the Montana corridor planning team examined the work of the New Mexico BLM corridor planning group. The process identified by the New Mexico BLM was premised on industry identifying windows. Although the New Mexico process appears to be a step in the right direction, it also exhibits some faults. In some instances, industry's projected needs may not correspond to the need for a facility in light of alternative technologies and other factors which the State of Montana must analyze. In Montana, state agencies, by law, must make location decisions for most electric transmission lines. Also, if industry identifies windows, analyzing the feasibility of designating an area may be precluded and questions about joint use of a corridor by different types of facilities may be ignored. Additionally, an inappropriate impression of preapproval of rights-of-way may be created. Before federal agencies designate corridors or before anyone can identify windows, a demand for the corridor or window must be established. It might be more appropriate for the state and federal land management agencies to identify windows on an as-needed basis, or possibly land management agencies and industry could identify windows concurrently in the context of evaluating proposals for specific facilities.

The New Mexico BLM's approach stops short of requiring the examination of possible alternatives (comparative studies—trade-off analyses) to determine the best location for a window. For instance, assume that a long mountain range has two passes, each technically suitable for a variety of linear facilities. One has an existing highway, an electric transmission line, and areas of valuable wildlife habitat and scenic appeal; the other, ten miles distant, contains an abandoned railroad right-of-way and a hiking trail, but exhibits only moderate environmental and resource values. If both passes might be needed as future rights-of-way, should one or both be designated as corridors, and if only one, which one? If the first were designated, and one new transmission line is built, environmental values could be degraded more than those in the second. On the other hand, if the second were designated, then two corridors would exist, the first a de facto corridor and the second a designated corridor. Corridor planning should be sensitive to the need for designation and use of designated corridors.

The New Mexico paper does not discuss management options and policies that could achieve part or all of the objectives served by corridor designation. It is possible that wide areas or gaps left between large exclusion or avoidance areas may contain smaller areas that would be suitable for rights-of-way foothills or valley margins, for example. One or more facilities could cross such areas and be relatively non-controversial from the standpoint of sound land management. However, a decision should be made to either cluster facilities to limit widespread impacts, or permit them to be dispersed laterally throughout the area. Clustering may reduce the proliferation of rights-of-way where topographic, land use, and other environmental constraints do not otherwise severely limit facility siting; such decisions may also serve to maintain multiple use principles over broader land areas.

In summary, a broad data base is needed to nominate and analyze areas for possible designation. Industry certainly has a large role to play in recommending its needs and possible areas to be designated; however, these recommendations cannot be adopted haphazardly due to lack of time, funding, and, possibly, local or regional perspectives. Agencies must avoid the historical reactive mode. A thoughtful, careful trade-off analysis, which weighs alternatives and fully involves the public and the states, will lead to better long-range planning for corridors and windows.

Selection of a Preferred Option

Two process options initially were identified to carry out the combined approach for identifying windows and exclusion and avoidance areas. These options are discussed below.

Option 1—Study of Single Areas

The problem areas identified in Figure 1 could be studied individually. There are several inherent problems with this approach. For example, problem areas are not precisely defined by specific, geographic boundaries.

Also, no application or trade-off of environmental issues was used to establish these areas or to determine whether alternative areas should be studied. Areas with no previously recognized conflicts could be ignored. Thus, a study under this option appears piecemeal. If all the problem areas could not be studied concurrently, some system would be needed to determine which areas should be studied first. This would not be easy to accomplish even with very detailed evaluation criteria. While priority could be given to the Missoula Valley over the Deer Lodge Valley, for example, the public acceptability of this decision probably would be low. Such a decision could be difficult to justify, if not impossible, given the fact that the problems in both areas involve land use conflicts primarily on private lands. This option could probably be carried out rather quickly and at a reasonably low cost to agencies, and it could effectively protect existing right-of-way areas (de facto corridors). However, it ignores the questions of feasibility and appropriateness of the areas as candidates for designated corridors. Therefore, the results would likely be inadequate and, possibly, indefensible. In short, studying single areas also would: (1) limit the application of exclusion and avoidance area criteria; (2) ignore possible windows and alternative corridor areas outside of those already identified, and, thereby, potentially increase environmental and social costs; (3) potentially mismatch windows and cause circuitous routing for some facilities; and (4) lead to haphazard designation without fully considering the need for such areas.

A variation of the single area option would involve ranking and studying problem areas and one or two alternatives identified by industry or through exclusion and avoidance criteria. Although this variation is advantageous because it promotes studying problem areas along with alternatives, it still approaches corridor planning and selection in a fragmented and piecemeal fashion and suffers from most of the same disadvantages as the single area option.

Option 2—Phased Identification of Windows and Exclusion and Avoidance Areas

Option 2 would approach corridor selection by identifying preferred pathways across the mountains through a system of interconnected windows and exclusion and avoidance areas. This process, diagramed in Figure 7 and outlined in Table 12, would begin by establishing exclusion and avoidance criteria and defining preferred characteristics for windows. This could be accomplished by a joint, intergovernmental team. After establishing exclusion and avoidance areas, the window selection criteria would be applied to the remaining areas. Known problem areas and candidate window areas then would be identified and evaluated by applying the criteria used to identify exclusion and avoidance areas. This would include an environmental analysis and trade-off of alternatives. Areas determined unfeasible for windows would be dropped from further study, although at some point in the future, such areas and, to some degree, avoidance areas, could be reconsidered.

This option is preferred to Option 1 because the first step would be to establish criteria for exclusion and avoidance areas and windows to identify such areas; the second step would be to evaluate known problem areas and alternate areas with the same criteria to determine their preliminary suitability as windows. These steps probably could be carried out on a statewide basis within the land use planning processes currently underway in the individual forests and districts of the FS and BLM.

Option 2 has several advantages as well as a few disadvantages. The major disadvantage is that a longer time period would probably be required to complete the process than would be required by Option 1. However, Option 2 best incorporates the combination approach for identifying exclusion and avoidance areas and windows. It reflects both state and federal priorities in corridor designation by protecting critical right-of-way areas at the time the need for a corridor in these areas is determined, while largely reducing possibilities for designating inappropriate areas and right-of-way proliferation. Option 2 seems to rank high on effectiveness, acceptability and defensibility of results, and opportunities for public involvement. In addition, it reduces the chance of mismatching windows.

Analysis and Implications

Two features of this second option, lacking in Option 1, are: (1) a process for determining the need for any given corridor; and (2) studying candidate windows in interconnected groups that form logical east-west

FIGURE 7

Flow Diagram of the Corridor Selection Process Using Option II

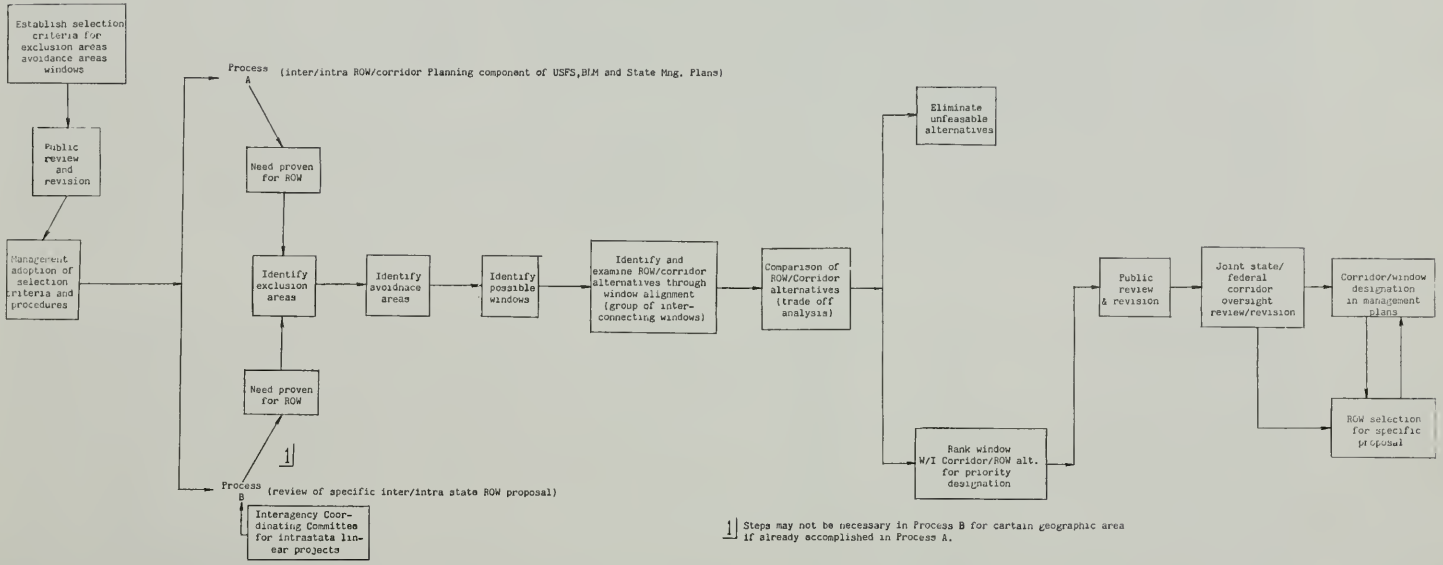


TABLE 12

Suggested Steps for Implementing Option II

I. Identify kinds of environmental impacts related to the location of the following:

1. Electrical transmission lines

2. Buried pipelines

3. Other kinds of linear facilities

II. Draft criteria (for each kind of facility) to be used to establish exclusion and avoidance areas based on the kinds of environmental impacts identified above and engineering considerations.

III. Distribute draft criteria (above) to utility sponsors, management agencies, and the public for comments, corrections, additions, etc.

IV. Decide questions relating to cartography such as:

1. Ultimate purpose and use of maps

2. Scale of maps to be used - based upon detail of information to be obtained, size and boundary detail of areas identified, etc.

3. Map base to be used

4. Etc.

V. Refine criteria (in II) based on mapping decisions and comments from the public, etc.

VI. Using the refined criteria, gather information and plot it on the map base in form of exclusion and avoidance areas for each kind of linear facility. The severity of potential impacts in the various avoidance areas may be indicated.

VII. Among the exclusion/avoidance areas of the map, identify all possible corridors. Windows are identified and possible interconnections identified.

VIII. Quantitatively measure and compare the suitability of various corridors and windows.

IX. Public review and revision - Public Meetings? E.I.S.? Publish Report with map(s)?

X. Acknowledge potential windows as planning corridors in land management plans.

pathways, such as potential windows across the Rocky Mountains or those providing an exit to northern Idaho.

The need for future rights-of-way in Montana cannot be reliably based on long term projections because of the dynamics of the energy situation. In the past decade, long term energy projections for needed facilities have proven to be misleading and inaccurate. Also, the State of Montana, recognizing the dynamics of reported need for facilities, has regulatory requirements to conduct studies to determine if the need for a linear facility is valid and further to establish that a given type of facility is the best alternative for meeting that need. The need for corridor designation and the need for and location of future facilities are so closely interdependent that initial corridor designation decisions should probably occur in the context of siting decisions for specific facilities. Corridor designation should not be based upon the assumption that all existing rights-of-way and de facto corridor areas can or should accommodate future rights-of-way.

Issues such as compatibility of existing and new facilities, land use, and social conflicts should also be factored into the designation process. As noted previously in this report, these issues must be studied and resolved on a case-by-case basis. If corridor designation occurs in the context of primary approval for a specific right-of-way project, the corridor would be preferred for future facilities in a given area until capacity considerations or other circumstances warrant looking at alternative planning corridors. At that time, the process for designation could be repeated.

Although actual designation of a corridor might not occur until the evaluation of a specific project establishes the need for the corridor, potential windows could be identified and formally recognized in federal land management plans. However, statewide implications of the corridor planning effort are clearly beyond the scope of individual forest or district management plans. Therefore, some means of comparing the preliminary findings of the forest and district plans is needed. A joint intergovernmental corridor oversight and review committee could be established to review interconnected groups of candidate windows on a comparative basis and recommend which areas should be formally identified in the land management plans. While there is a willingness from the state, USFS, and BLM to participate on this committee, the role and authority of the committee needs to be clearly defined before the state can commit itself to be a participant. Likewise, USFS and BLM need to carefully consider the implications of state involvement.

SECTION IV—CONCLUSIONS AND RECOMMENDATIONS

This section presents only the major conclusions of the Montana corridor planning study to date. Other secondary conclusions are contained in the individual chapters of this report.

Corridor planning efforts on the state, regional, and national levels are occurring concurrently and rapidly. Federal and state efforts in Montana seem to be consistent with results from other corridor planning studies. There are however, a number of ambiguities and possible contradictions in statutes and policies of state and federal agencies which could affect future corridor planning and management. These should be addressed by the individual participants.

In general, the topography of western Montana constrains the location of facilities. Physical characteristics in other parts of the state are less critical. Existing facilities in Montana are concentrated in river valleys and low elevation mountain passes. There is an urgent need to develop effective policies and procedures for managing linear facilities in these areas and locating new facilities, if necessary, through them.

Planning for future rights-of-way is an imprecise task. Many variables affect when and where new facilities will be needed. The planning for and designation of corridors is equally imprecise. State and federal agencies alone cannot plan for future rights-of-way or corridors.

Technical compatibility factors are so complex that a case-by-case evaluation is probably necessary to determine compatibility between a new facility and existing facility, especially in constrained areas.

Issues of technical compatibility, social and land use concerns, and land ownership patterns must be considered not only in right-of-way decisions for individual linear facilities but also in corridor planning and designation decisions.

Direct and indirect approaches to corridor designation have inherent problems. Direct designation can be inflexible and reactive, while indirect designation can be overly flexible and also reactive. A combination of both approaches presents more advantages than disadvantages to meet both federal land planning responsibilities and to consider the state's regulatory role in siting certain linear facilities.

A phased study of interconnected windows and exclusion and avoidance areas appears to be the best method to identify and ultimately designate corridors. Such a process will also accommodate site specific review of individual project proposals.

Since its difficult to determine the need for corridors to accommodate future rights-of-way, initial corridor designation should occur in the context of decisions on routes for specific linear projects.

Recommendations to the Montana study and guidance for other western state corridor efforts are:

1. Continue the principle of intergovernmental cooperation for future corridor planning and right-of-way siting in Montana.

2. Adopt the combined window, exclusion area and avoidance area concept for identifying and selecting corridors in Montana by implementing the "Option 2—Phased Identification of Windows and Exclusion and Avoidance Areas." Develop criteria for identifying exclusion areas, avoidance areas, and windows. This task would include public involvement, with recommendations advanced to the Governor of Montana, Region 1 Forester, and the Montana State Director of BLM.

3. Incorporate the direction of Recommendation 2 into federal land management planning.

4. Establish a joint federal/state Corridor Oversight Committee to review land management plans and to assure that Montana corridor goals are achieved. The authority and functions of this committee still need to be defined.

5. Develop a common federal/state analysis, evaluation and decisionmaking process for individual right-of-way proposals under joint jurisdiction of federal and state agencies.

6. Advance Montana's joint corridor planning approach to other federal and state agencies in the West to achieve interstate consistency in right-of-way and corridor decisions.

7. Encourage public participation by distributing a summary of this report to the public for review and comment.

8. Develop the Phase V Right-of-Way Management Program as a separate effort.

GLOSSARY

Avoidance areas—Land areas that pose particular environmental impacts which would be difficult or impossible to mitigate or which impose unusual engineering constraints.

Blanket easement—An easement covering an entire legal subdivision such as a quarter, half, or entire section of land.

Centerline—The precise location of the center of a right-of-way as surveyed and staked on the ground.

Commercial forest land—Lands growing stands of trees which possess present or potential market value.

Common use—Two or more facilities, either owned by the same company or different companies, occupying the same right-of-way or sharing part of that right-of-way.

Compatibility—The ability of two or more facilities to be constructed or to function in proximity without significant interference.

Conservation easement—A nonpossessing interest held by one person in land of another person, whereby the first person is accorded partial control over the land for the care and preservation of certain resources so as to prolong their use or make for their more effective use.

Corridor—A strip of land usually a few to many times the width of a right-of-way through which one or more existing or potential linear facilities may be located.

Corridor capacity—(See working capacity).

Cultural environment—That part of the environment definitely of human origin.

De facto corridor—An area in which one or more linear facilities already exist.

Designated corridor—A linear area of land with legally defined and recognized boundaries and capacities having ecological, technical, economic, social, or similar advantages over other areas for the present or future location of transportation or utility rights-of-way, and which has been identified and designated by legal public notice.

Designation—The act of giving legal public notice (to legally denote).

Eminent domain—The right or power by which a sovereign government, or some person acting in its name and under its authority, may acquire private property for public or quasi-public use upon payment of just and reasonable compensation.

Environment—The aggregate of physical, biological, economic, and social factors affecting organisms in an area.

Exclusion areas—Land areas determined to be unavailable for corridor allocation or facility siting for reasons of unsuitability, legislative classification, or prior, unalterable allocation to uses incompatible with facility siting.

Facility—An energy generation, conversion, and other industrial plant capable of producing, refining, or converting resources into consumable products such as electricity.

Fault currents—A current of electricity passing through some medium not designed to carry it because of a defect or malfunction.

Federal lands—All classes of land owned by the federal government.

Guidelines—A guide or indication of a future course of action.

Inverse condemnation—A legal process by which an owner may claim damages for loss in value of his property and receive compensation for such losses when the action or proposed action which resulted in damages is undertaken by a government body or its representative without reason or occasion to exercise the power of eminent domain.

Joint use—(See common use).

Linear facility—A highway, railroad, electric transmission line, pipeline or other facility that occupies an area many times longer than its width and is designed and built or installed to serve a specific utility or transportation function.

Natural environment—That part of the environment existing and functioning essentially independently of humans.

Overthrust Belt—A strip of land along the eastern edge of the Rocky Mountains characterized by geologic structures believed to contain oil and gas deposits.

Planning corridor—A generally broad rather than narrow area used to evaluate where a specific right-of-way should be placed.

Policy—Agency management positions established by or developed pursuant to applicable law and regulation.

Right-of-way—The strip of land designated through easement, condemnation, or fee ownership as the location for a specific linear facility.

Right-of-way grants—A permit or easement document which authorizes the use of a right-of-way.

Route—A general, acceptable location for a proposed right-of-way within a planning corridor that is subject to adjustments of a prespecified magnitude and nature during centerline selection. One of the purposes of alternative route designation is to provide for comparative assessment of such considerations as length, river or stream crossings, land types, and ecosystems involved, etc.

Semi-public uses—Uses which are to some degree public in nature, but not fully public.

Siting—A process to locate or identify a location for a facility.

Siting criteria—An established, common set of standards, guidelines, and considerations applied in a siting analysis to provide a uniform basis for decision.

Standard—Something considered by an authority or by general consent as a basis of comparison, an approved model, a rule or principle used as a basis of judgment.

Williston Basin—A geologic basin in northeastern Montana, North Dakota, and adjacent Canada containing large deposits of petroleum and natural gas.

Window—Usually short, narrow passageways through constrained areas which are the most feasible potential locations for linear facilities, considering engineering and/or environmental factors.

Working capacity—As designated by a land management or regulatory agency, the number of linear facilities that a corridor is deemed capable of holding without unacceptable environmental, land use, or technical compatibility problems.

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Hazardous Liquids Pipeline Safety Act of 1979: 49 U.S.C.A. 2001 et seq.

Major Facility Siting Act: M.C.A. 75-20-101 et seq.

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National Environmental Policy Act: 42 U.S.C.A. 4321 et seq.

National Forest Management Act: 16 U.S.C.A. 1600 et seq.

Natural Gas Pipeline Safety Act: 49 U.S.C.A. 1671 et seq.

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Montana Department of Natural Resources and Conservation:
Rules for Major Facility Siting Act: A.R.M. 36-2-8(1)-5800 et seq.

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Council on Environmental Quality:
Regulations for National Environmental Policy Act: 40 C.F.R. part 1500.

Montana Department of Highways:
Regulations for highway right-of-way occupancy: A.R.M. 18-7-201 et seq.

APPENDIX A—LIST OF CORRIDOR STUDY CONTACTS

Utility and Transportation Companies or Groups

American Petroleum Institute
Basin Electric Company
Burlington Northern, Inc.
Central Montana GNT-Coop, Inc.
Continental Pipeline Company
Idaho Power Company
Montana-Dakota Utilities Company
Montana Power Company Montana
Petroleum Association Mountain
Bell Telephone Company
Northern Lights, Inc.
Northern Tier Pipeline Company
Pacific Power and Light Company
Rocky Mountain Oil and Gas Association
Tennessee Gas Transmission Company
Union Pacific Railroad Company
Utilities Committee of International
Rights-of-Way Association Washington
Water Power Western Utility Group

Member Organizations

Environmental Information Center
Montana Association of Conservation Districts
Montana Association of Counties
Montana Association of Planners
Montana League of Cities and Towns
Montana Intertribal Policy Board

Federal Agencies

Bonneville Power Administration
Bureau of Land Management State Offices
U.S.F.S. Regions 2, 3, 4, 5, 6
Individual forests within Region 1, U.S.F.S.
U.S. Fish and Wildlife Service
Western Area Power Administration

State Agencies

Dept. of Community Affairs
Dept. of Fish, Wildlife & Parks
Dept. of Health & Environmental Sciences
Department of Highways
Dept. of State Lands
Environmental Quality Council
Montana Historical Society
Dept. of Natural Resources & Conservation

Individual States and Regional Organizations

Governor of Idaho
Governor of North Dakota
Governor of Oregon
Governor of South Dakota
Governor of Washington
Governor of Wyoming
Western Interstate Energy Board

Canadian Provinces

Premier of Alberta
Premier of Saskatchewan
Premier of British Columbia

APPENDIX B—MODIFICATION OF THE WORK MANAGEMENT PLAN

Montana's corridor planning study has reached a point where future efforts must address two sets of actions. One set of actions is a broad planning process for designating corridors. The other actions involve specific evaluations of individual projects, either interstate or intrastate, on a case-by-case basis through joint intergovernmental procedures. The two actions, under the Work Management Plan of this study, were to be addressed in Phases II, III and IV following completion of Phase I. As explained in the introduction to the accompanying report, Phase I and portions of Phase II and III have been addressed. Table B1 lists the steps of Phases I—IV which are complete, those which are underway, and those which remain for future study efforts. Phase V, which was to develop a joint intergovernmental right-of-way management program, has not yet been addressed by the corridor planning group.

The accompanying report accomplishes the major steps of Phase II and Phase III, including a recommended joint siting methodology for corridors (step 17), and a recommended general option (process) for corridor evaluation (step 24). Efforts to date on the state level have largely focused on joint processes for corridor identification, selection, and possible designation. Regional efforts by WIEB have been toward cooperative procedures for joint intergovernmental review of individual interstate projects. The most important similarity among these efforts is that joint intergovernmental procedures at the state level are required to accomplish review of either corridors or individual projects.

Since procedures have not been developed in Montana for either of these actions, several steps outlined in the Work Management Plan still require attention. For example, the accompanying report does not address specific procedures for implementing the broad corridor planning process suggested in Section III. That is the next step. In addition, the report does not address procedures for site specific, joint review of individual project proposals by the FS, BLM, and the state. This may include modifying existing agreements or developing new agreements. In short, developing specific procedures for taking these actions still is necessary; however, such a step no longer fits into the phases originally set out in the Work Management Plan.

Figure B1 shows the general process for Phase I and indicates where additional steps were taken in order to keep abreast of national corridor planning efforts. These additional steps have led to major recommendations for future corridor planning in Montana presented in section IV of the report. Also included in Figure B1 is a modified process for future actions that combines uncompleted steps from Phase II and Phase III, and parts of Phase IV.

Uncompleted steps in Phases II, III and IV depend on developing siting policies and criteria. Steps 13, 14, and 15 were designed to provide this information and follow logically from Phase I. Criteria or standards are needed to guide both the joint review of individual projects and the selection of corridor areas. To accomplish this, step 15 should be expanded to include the concurrent development of general criteria for linear facilities as well as specific criteria for selecting windows, exclusion areas, and avoidance areas.

Step 16 was originally designed to develop general right-of-way stipulations by facility type. This step should recognize the need for joint state and federal review of both interstate and intrastate projects. Interstate projects are the subject of WIEB's efforts to develop a state/federal coordination program, but state and federal agencies in Montana also need specific procedures for evaluating such projects within the state's boundaries. In many respects, the procedures developed for intrastate projects could apply to interstate projects and, thus, could supplement the general guidance provided by WIEB's work.

The steps to develop criteria and evaluate and select corridors consistent with the process recommended in Section III of this report were originally parts of Phase I, Phase II, and Phase IV. Corridor program development could proceed by rearranging the original steps as follows: test the implementation option (step 28), present results for review (steps 25 and 25a), obtain management recommendations for designation (step 26), and designate corridors on federal land (step 29). After designation, these corridors would be included in land use plans and would be used in making future right-of-way decisions until the need for a new corridor is demonstrated (steps P6, P7, and P8). The only remaining steps would be those to test the right-of-way review program (steps 30-33). These steps could begin whenever joint assessment procedures are established. Granting a right-of-way for an individual project would depend on the results of an EIS and, if appropriate, an option summary as to whether or not a designated corridor should be used.

The remaining steps in the Work Management Plan should be tailored to address procedures for both joint state/federal review of right-of-way proposals in Montana and federal corridor actions. The dynamics of corridor planning efforts in the western United States dictate that remaining steps in Phases II and III and part of Phase IV be combined to better balance state and national corridor planning goals and objectives. Combining phases would mean expediting the corridor planning process beyond the point of state involvement agreed to in the original Work Management Plan. Phase IV was to proceed when Phases I, II and III were complete. Each of Phases I, II, and III was to receive thorough review and approval. Combining phases also will mean that both the corridor selection process (Phase IV) and the joint right-of-way review program (Phase II) would be developed simultaneously. Combining these phases does not mean that review and approval steps are dropped; rather they would occur concurrently. Parts of Phase IV should not be combined, however. Steps 30

TABLE B-1

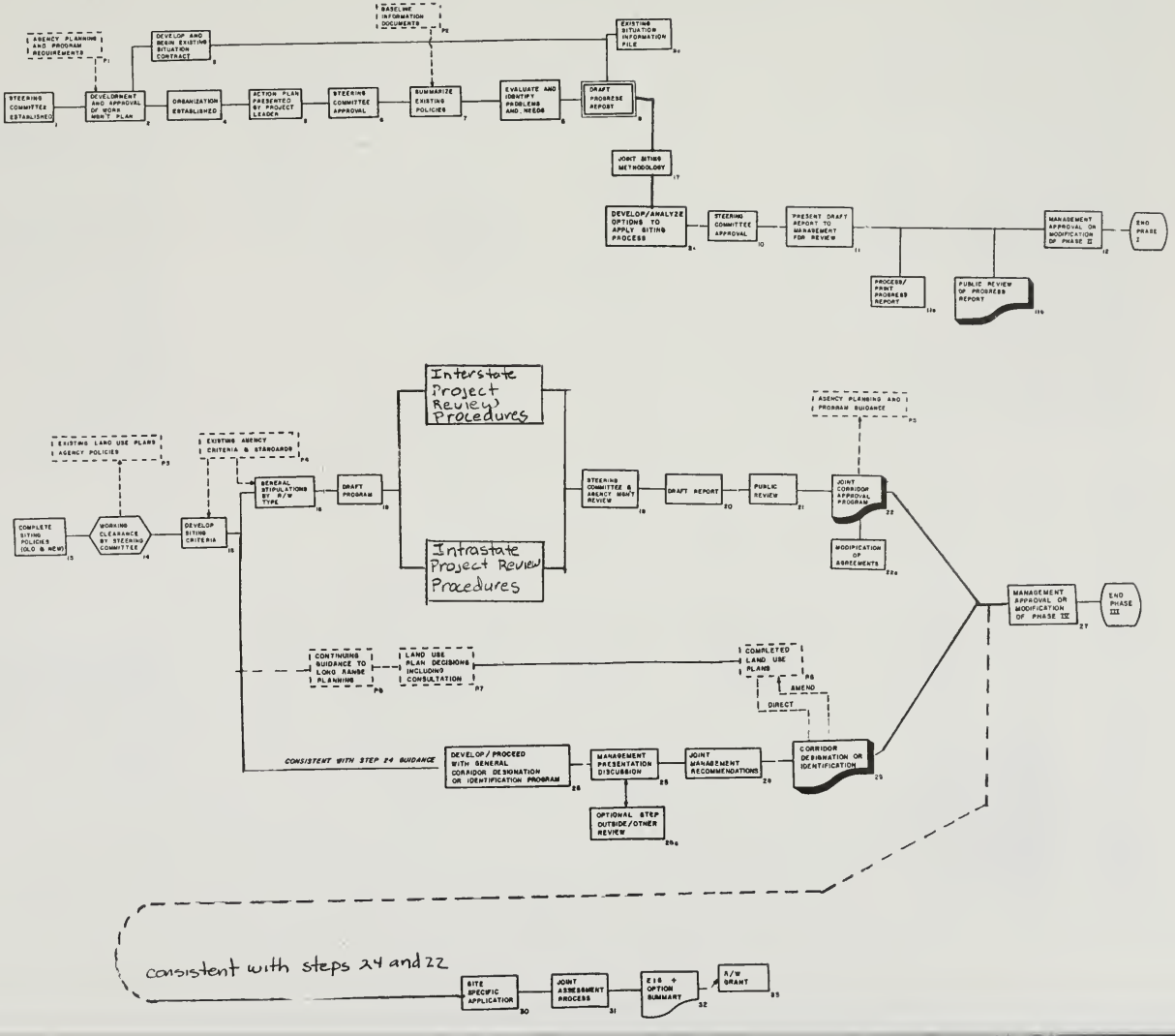
The Status of Phases I, II, III, and IV

STEPS PHASE I	Status A	B	C	STEPS PHASE II	Status A	B	C	STEPS PHASE III	Status A	B	C	STEPS PHASE IV	Status A	B	C
Step 1			x	Step 13		x		Step 24			x	Step 28	x		
Step 2			x	Step 14		x		Step 25	x			Step 29	x		
Step 3			x	Step 15	x			Step 25a	x			Step 30	x		
Step 4			x	Step 16	x			Step 26	x			Step 31	x		
Step 5			x	Step 17			x	Step 27	x			Step 32	x		
Step 6			x	Step 18	x							Step 33	x		
Step 7			x	Step 19	x										
Step 8			x	Step 20		x									
Step 9			x	Step 21	x										
Step 9a			x	Step 22	x										
Step 10		x		Step 22a	x										
Step 11		x		Step 23		x									
Step 11a		x													
Step 11b		x													
Step 12		x													

KEY: A = Not begun
B = Underway
C = Complete

FIGURE B 1

Suggested Revision of the General Corridor Planning Study Process



through 33 should remain separate and should proceed when work on the combined phases is complete.

ADVANTAGES AND DISADVANTAGES

The advantages of combining the remaining steps outweigh the disadvantages. Combining steps will insure that Montana's corridor planning efforts stay abreast or ahead of those on the national and regional levels. This will help balance state and national corridor priorities. A major disadvantage is that expediting corridor planning will change the process laid out in the Work Management Plan. This disadvantage should be offset by combining the phases so that Montana corridor study goals and objectives can be achieved in a timely manner and still reflect the intent of the original process.

RECEIVED
OCT 3 0 1980
OCT 3 1980
MONT. DEPT. OF NATURAL RESOURCES & CONSERVATION

REPLY TO: 1990 Special Plans and Studies
2170 Energy Management

SUBJECT: Utility-Transportation Corridor Study (State of Montana)

TO: Steering Committee

Attached is an action plan for accomplishing the Corridor Study. Our cost estimates for Phase I total $27,900. The project team recommends the following agency task and cost distribution:

State		
Provide and fund a Resource Specialist		
a. Salary		$7,000
b. P/D and travel		2,000
Part-time Secretary		300
	TOTAL	$9,300
BLM		
Provide and fund cartographers		
a. Salary - 6 mos.		$9,000
Part-time Secretary		300
	TOTAL	$9,300
FS		
Provide and fund a cartographer (part-time)		
a. Salary - 2 mos.		$3,000
Drafting materials and map copies		5,000
Part-time Secretary and misc. supplies		1,300
	TOTAL	$9,300

Implementation can begin as soon as the action plan is approved.

EARL N. REINSEL
Project Manager

cc: Team Members

Enclosure

We concur with recommendations and attached Action Plan:

Montana Dept. of State Lands	10/27/80 Date
MT Dept. of Natural Res. & Consrv.	10/17/80 Date
Bureau of Land Management	10-16-80 Date
Forest Service	10/7/80 Date

APPENDIX C—UTILITY-TRANSPORTATION CORRIDOR STUDY

ACTION PLAN—PHASE I (10/80)

Background

Energy development activities are increasing in Montana. They include the construction of electric generating stations, drilling of oil and gas wells, and mining of coal—to name a few. Demands for energy transportation facilities and land to accomodate these facilities are also increasing. Most of these facilities are accomodated in linear rights-of-ways. Some non-energy related facilities such as highways and telephone lines also fit linear situations. This study will consider the location and management of linear rights-of-ways in broad or corridor context. Phase I will examine the present situation and needs. Subsequent phases will follow through on development of (1) cooperative policies and procedures, (2) options for applying siting process, (3) corridor allocation, and (4) right-of-way management.

Objectives

1. Establish an interagency utility-transportation corridor coordinating process.

2. Analyze existing utility-transportation corridor policies and standards and identify where changes or additional policies and standards may be necessary.

3. Inventory and map existing and proposed utility-transportation facilities.

Study Approach

Units Involved

Forest Service (FS), Bureau of Land Management (BVLM), and State of Montana (State) units with functional responsibilities for corridor location and management as well as selected outside groups/agencies (Federal, industrial, special interest will be contacted in gathering data for the study.

Scope

Phase I will inventory existing facilities and analyze policies and standards related to utility-transportation corridor facilities. Problem area and needs will also be documented. The identification and analysis of new policies and standards with recommendations for any changes will be a separate (follow up) effort (Phase II).

Constraints

Phase I completion date is January 30, 1981. Meeting this completion date depends on the capability to begin the information collection stage October 1 and the mapping stage by October 15.

Approach and Approximate Time Frames

1. Identify present management situation
   a. Inventory existing facilities
   b. Identify designated corridor (BLM) } collect bulk of info by 11/1, complete info collection by 1/1/81
   c. Inventory proposed facilities
   d. Identify technical standards and constraints
      — for individual facilities — complete by 12/15
      — For conflicting uses between facilities
   e. Summarize existing policies, regulations, legislation, and other considerations
      — FS
      — BLM — complete by 12/15
      — State of Montana
      — Other (Utilities, REAs, etc.)
   f. Prepare overlays of information collected in a., b., and c. — complete by 1/20

2. Analyze Management Situation
   a. Identify problems and conflicts
   b. Identify needs for additions or changes in:
      — policies
      — standards
      — legislation
      — regulations
   (prepare preliminary evaluations)

   } complete by 12/31

3. Program Report
   a. Summarize 1 and 2 above
   b. Develop recommendations for proceeding with subsequent phases of the study
   c. Document the coordination process

   } complete by 1/31

Study Responsibilities

Study project manager is Earl Reinsel (FS). Other primary team members are Ray Breuninger (State) and Claude Roswurm (BLM).

Estimated Budget (does not include primary team time)

a.	Salaries	
	Resource Specialist (information collection) (GS-7/9) — 4 mo.	$7,000
	Cartographer — 2 FT x 4 mo. (GS-7)	12,000
	Clerk Typist — 1 mo. (GS-4)	1,200
b.	Travel/PD	2,000
c.	Drafting Materials and Map Copies	5,000
d.	Miscellaneous	700
	Total	$27,900

APPENDIX C-1—UTILITY-TRANSPORTATION CORRIDOR STUDY PUBLIC INVOLVEMENT PLAN

Phase I—Existing Situation and Need

This plan expands on the general framework in the Action Plan. Objectives are defined and responsibilities assigned.

General Objectives

1. Inform
2. Invite participation
3. Provide opportunities for public(s) to be involved early and continuously during the process.

General Responsibilities

The public involvement program will be managed by Earl Reinsel, Project Manager. The State of Montana/BLM/Forest Service will help develop and implement the public involvement program as one of their cooperative agency responsibilities. The Steering Committee will advise the Project Manager during implementation of the public involvement program.

Specific Objectives

1. Inform the public that the planning process is starting.
2. Provide for Federal and State Agencies and public(s) to gain involvement and cooperation.
3. Develop a data base for the existing situation.
4. Provide for future public involvement.

Method

	Action	Responsibility	Date
1.	Inform local media about the proposal thru news release;	Project Manager	Oct. 1980
2.	Develop a complete contact list of transportation utility corridor users;	Project Team	Oct. 1980
3.	Develop a list of individuals and groups who might want to be involved with the project;	Project Team	Oct. 1980
4.	Initially contact specific affected agencies and parties. Request their cooperation in study. Send information letters to adjoining States and Canadian provinces;	Project Manager	Oct. 1980
5.	Follow up with agency and parties for specific procedural and data needs;	Project Team	Begin Oct. 1, Complete by 12/15/80
6.	Submit draft progress report to Steering Committee and other agencies, as appropriate, for review;	Project Team	Jan. 1981
7.	Submit program report to Management. If management determines it is appropriate, publish and disseminate for public review and comment.	Agency Management w/follow up by Project Manager	Feb.-March 1981

APPENDIX C-2—UTILITY-TRANSPORTATION CORRIDOR STUDY

Phase I—Inventory Specifications

Present Management Situation and Needs

1. Inventory and map existing and proposed facilities, and designated corridors.

   Specification of work products

   The group will obtain base maps of the state, at the following scales:

   a. 1:500,000 USGS topographic maps (two sheets provide statewide coverage);
   b. 1:250,000 USGS topographic maps (26 sheets provide statewide coverage);
   c. 7.5 and 15 minutes USGS topographic quadrangle maps, and 1:1,000,000 or 125,000 USGS topographic "intermediate scale" maps, as needed to provide coverage of local problem areas; problem areas are not yet known but will largely be in (a) congested areas near major cities, and (b) narrow mountain valleys and passes.

   Three sets of these base maps will be obtained, one set for each of the three participating agencies.

   For each base map, the work group will prepare four reproducible overlay maps, as follows:

   a. Electric transmission and generation

      Existing electric transmission lines with a rating greater than 69 kV, and substations served by these lines; existing electric generation facilities 50 MW and larger which serve linear transmission facilities.

   b. Fuels transmission and production

      Existing oil, gas, and refined product pipelines with a diameter 6 inches and larger which provide off-field transportation; oil and gas fields which are major energy sources; gas plants and refineries; synfuel facilities (such as coal liquefaction), and other major facilities not mapped elsewhere (including major coal mines); associated facilities such as delivery facilities, compressor and pump stations.

   c. Transportation and Communication

      Transportation and communication facilities not already shown on the base maps; these include intracity telephone trunks, microwave relay stations; railroads, and major state, and federal roads. Significant abandoned and "not used" rights-of-way shall be distinquished clearly from those in use.

   d. Potential facilities

      Projected needs and proposed facilities as indicated by R/W users falling into the above three categories. During Phase I these overlay maps will be prepared only at 1:500,000 scale and will distinguish between those potential facilities which have (a) not yet been formally proposed, (b) those which have been proposed and are under study by governmental agencies but which have not received all necessary permits, and (c) those which are under construction or have all permits. Also plotted on this overlay map will be those two corridors already designated formally by the BLM. As work progresses on Phase II, some of the potential and proposed facilities may be platted onto overlay maps at 1:250,000 and large scale, if their proposed locations are precise.

   A clear, transparent copy of each of the overlay maps will be provided to each participating agency. Additional overlays of problem areas will be generated during the course of the study, and copies provided to each agency routinely. Each agency may also request paper copies of any individual overlay map, but not complete paper sets will be produced during Phase I.

   Each master overlay map will be drafted on translucent mylar or an equivalent material. Each overlay will be referenced with date of compilation, scale, copiler and location, sources of data and dates of source data, legend, and other information as appropriate. All plotted data will be reproducible in black and white copies. Registration of overlay maps will be done with pins tabbed onto each base map.

   Aqueducts, such as irrigation canals or water pipelines, will be plotted where they follow or impact an existing rights-of-way.

2. Gather and analyze existing utility-transportation corridor policies and standards. Identify where changes or additional policies and standards may be necessary.

   a. Inventory information related to environmental and engineering considerations of the following industries and organizations (policies, standards, constraints).

      — Electrical
      — Pipeline
      — Telephone
      — Coal Mining
      — Railroad
      — Highway
      — Gasification

   b. Analyze and evaluate information gathered in a.

3. Information sources

   Preliminary listing of major information sources is as follows:

   Western Utility Group
   Railroads—BN, UP
   Coal companies
   Telephone companies—Mountain Bell, CO-ops, etc.
   Power companies—MPC, Basin, Washington Water and Power, etc.
   Rural Electric Cooperatives
   Federal Power Agencies—WAPA, BPS, WAPR, CE
   Montana Bureau of Mines and Geology, U.S.G.S.
   DNRC Oil and Gas Conservation Division
   Montana Department of Highways

   This list will be expanded during the first month of Phase I work, as data on existing and proposed facilities is compiled.